13	**AGENDA ITEM** **ST. JOHNS COUNTY BOARD OF COUNTY COMMISSIONERS**
	Deadline for Submission - Wednesday 9 a.m. – Thirteen Days Prior to BCC Meeting

10/6/2026

BCC MEETING DATE

TO: **Joy Andrews, County Administrator** **DATE:** **August 13, 2026**

FROM: **Jaime Locklear, Director, Purchasing** **PHONE:** **904 209-0158**

SUBJECT OR TITLE: **Award of Invitation for Bids (IFB) No: 2995; North Beach Water Treatment Plant Improvements**

AGENDA TYPE: **Bid Award, Consent Agenda, Contract, Resolution**

BACKGROUND INFORMATION:

The North Beach Water Treatment Plant Improvements project includes constructing a new treatment building to include new Reverse Osmosis (RO) feed pumps, RO skids, high service pumps, clean-in-place tank and pump, antiscalant tank and skid, electrical room and gear, air conditioning, restroom and storage. In addition to the building, the project will include demolition of the existing treatment building and existing rectangular storage tank, new transformer and pad, generator, new plant control system and integration to SCADA, relocation of sodium hypochlorite tank and skid, site grading and drainage, and yard piping modifications as shown on the Drawings and as specified herein. The SJC Purchasing Department issued an Invitation for Bids ("IFB") in accordance with SJC Purchasing Policy. Five (5) bids were submitted, with the lowest, responsive, and responsible Bid being submitted by SGS Contracting Services, Inc., at a lump sum base bid price of $5,296,700.00, Allowance 1 for Florida Power and Light involvement in an amount of $10,000.00, Allowance 2 for AT&T involvement in an amount of $20,000.00 and Alternate 1 price for an Odor Control System in an amount of $1,649,700.00 for a Total Lump Sum Bid Price of $6,976,400.00. Staff recommends Board approval to award IFB No: 2995 to SGS Contracting Services, Inc., and to execute a contract in substantially the same form and format as attached for completion of the project in accordance with IFB No: 2995. Due to the size of the Exhibits and Attachments, they are available upon request from Jaime Locklear.

1. IS FUNDING REQUIRED? Yes **2. IF YES, INDICATE IF BUDGETED.** Yes

IF FUNDING IS REQUIRED, MANDATORY OMB REVIEW IS REQUIRED:

INDICATE FUNDING SOURCE: Utility Services Unrestricted Capital Projects-System Improvements-North Beach Water Treatment Plant Facility (4488-56302-6285)

SUGGESTED MOTION/RECOMMENDATION/ACTION:

Motion to adopt Resolution 2026-_____, authorizing the County Administrator, or designee, to award IFB NO. 2995; North Beach Water Treatment Plant Improvements to SGS Contracting Services, Inc., as the lowest, responsive, and responsible bidder, and to execute a contract in substantially same form and format as attached hereto, at a total lump sum bid price of $6,976,400.00 for completion of the Work.

For Administration Use Only:
Legal: Jalisa Ferguson 9/21/2026 **OMB: CR 9/21/2026** **Admin: Brad Bradley 9/21/2026**

RESOLUTION NO. 2026 -_____

A RESOLUTION BY THE BOARD OF COUNTY COMMISSIONERS OF ST. JOHNS COUNTY, FLORIDA, AUTHORIZING THE COUNTY ADMINISTRATOR, OR DESIGNEE, TO AWARD BID NO. 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS TO SGS CONTRACTING SERVICES, INC. TO THE LOWEST, RESPONSIVE, RESPONSIBLE BIDDER, AND TO EXECUTE AN AGREEMENT FOR COMPLETION OF THE PROJECT.

RECITALS

WHEREAS, this project includes constructing a new treatment building to include new Reverse Osmosis (RO) feed pumps, RO skids, high service pumps, clean-in-place tank and pump, antiscalant tank and skid, electrical room and gear, air conditioning, restroom and storage. In addition to the building, the project will include demolition of the existing treatment building and existing rectangular storage tank, new transformer and pad, generator, new plant control system and integration to SCADA, relocation of sodium hypochlorite tank and skid, site grading and drainage, and yard piping modifications as shown on the Drawings and as specified herein; and

WHEREAS, through the County's formal Bid process, SGS Contracting Services, Inc. was the lowest, responsive, responsible bidder, with a lump sum base bid price of $5,296,700.00, Allowance 1 for Florida Power and Light involvement in an amount of $10,000.00, Allowance 2 for AT&T involvement in an amount of $20,000.00 and Alternate 1 for an Odor Control System in an amount of $1,649,700.00 for a total lump sum bid price of $6,976,400.00; and

WHEREAS, the County finds that entering into a contract for completion of the work serves a public purpose, and the contract will be in substantial conformance with the attached draft; and

WHEREAS, the project will be funded by the Utility Department.

NOW, THEREFORE BE IT RESOLVED BY THE BOARD OF COUNTY COMMISSIONERS OF ST. JOHNS COUNTY, FLORIDA, as follows:

Section 1. The above Recitals are incorporated by reference into the body of this Resolution and such Recitals are adopted as finds of fact.

Section 2. The County Administrator, or designee, is hereby authorized to award Bid No. 2995 to SGS Contracting Services, Inc. as the lowest, responsive, responsible Bidder with a total lump sum price of $6,976,400.00.

Section 3. Upon approval by the Board of County Commissioners, the County Administrator, or designee, is further authorized to execute an agreement in substantially the same form and format as the attached draft for the completion of the project as specifically provided in Bid No: 2995.

Section 4. To the extent that there are typographical and/or administrative errors that do not change the tone, tenor, or concept of this Resolution, then this Resolution may be revised without subsequent approval by the Board of County Commissioners.

PASSED AND ADOPTED by the Board of County Commissioners of St. Johns County, Florida, this ____ day of _____, 2026.

BOARD OF COUNTY COMMISSIONERS OF ST. JOHNS COUNTY, FLORIDA

By:_____
Clay Murphy, Chair

ATTEST: Brandon J. Patty,
Clerk of the Circuit Court & Comptroller

By: _____
Deputy Clerk

MASTER CONSTRUCTION AGREEMENT
BETWEEN
ST. JOHNS COUNTY AND CONTRACTOR

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This Master Construction Agreement ("Contract") is made this _____ day of _____, 2026 (the "Effective Date") by and between **ST. JOHNS COUNTY** ("County"), a political subdivision of the State of Florida, whose principal offices are located at 4040 Lewis Speedway, St. Augustine, FL 32084, and **SGS CONTRACTING SERVICES, INC.** ("Contractor"), a company authorized to do business in the State of Florida, with its principal offices located at: 256134 W. US HWY 27, High Springs, FL 32643, Phone: 386-361-5300, and E-mail: seth@sgscsi.com, for **IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS** hereinafter referred to as the "Project". When referenced together, the County and Contractor shall collectively be referred to as the Parties.

In consideration of the mutual promises and covenants contained herein, the Parties hereby agree as follows:

ARTICLE I CONTRACT DOCUMENTS

1.1 The Contract Documents

1.1.1 The Contract Documents are the collective documents which form the Contract, and shall govern completion of the Work. The Contract Documents hereby include the following:

a) Fully Executed Change Orders and Amendments to this Agreement;
b) Field Orders signed by County's Project Manager;
c) Notice to Proceed;
d) This Master Construction Agreement and all Exhibits and/or Attachments hereto:
    i. Exhibit A – North Beach WTP Improvements Project Manual – June 2026
    ii. Exhibit B – North Beach WTP Improvements Drawings – June 2026
    iii. Exhibit C – North Beach WTP Generator and Equipment – June 25, 2026
    iv. Exhibit D – North Beach WTP Electrical Equipment – June 23, 2026
e) Bonds and Insurance furnished by the Contractor in accordance with Article XIII herein;
f) Bid Documents and Bid Forms with all addenda thereto for IF Bid No. 2995

1.1.2 Documents not enumerated above are not Contract Documents and do not form part of this Contract. No terms, conditions, limitations or exclusions in Contractor's submitted Bid or invoices shall be binding upon County or become part of the Contract Documents. In the event of discrepancies, the Contract Documents shall be interpreted in the order of precedence as listed above in Section 1.1.1. Additionally, Specifications shall govern over Drawings, electronic documents shall govern over hard-copy documents, numerical dimensions shall govern over dimensions acquired by scaling, and fully executed documents shall govern over unsigned drafts.

1.1.3 Shop Drawings, Product Data, Samples and similar submittals (hereafter "Submittals") are not Contract Documents. The County will review and take action upon Contractor's submitted Submittals but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. Review of Submittals is not conducted for the purpose of determining the accuracy and completeness of other details, such as dimensions and quantities, nor for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of Contractor.

1.1.4 All Submittals (whether in hard or soft copy) prepared by or on behalf of Contractor in the course of the Work shall be the exclusive property of the County. Ownership of any proprietary information or intellectual property contained in such Submittals shall remain with Contractor. Contractor grants the County a perpetual, royalty-free, license to use, copy and allow third parties to use such Submittals and all proprietary information contained in them as may be required for the County's internal business purposes including without limitation tendering, installing, operating, repairing, maintaining, modifying, reconstructing, replacing and/or upgrading the Work. Such license shall be capable of transfer and/or sub-licencing in whole or part without notice to or further consent of Contractor. Contractor shall not be held liable for reuse of Contractor's Submittals by the County for purposes other than originally intended as stated in the Contract Documents.

1.1.5 Contractor is solely responsible for requesting instructions, interpretations, or clarifications to the Contract Documents and is solely liable for any costs and/or expenses arising from its failure to do so. Contractor shall have a continuing duty to read, carefully study and compare each of the Contract Documents, the Submittals and shall give immediate written notice to the Project Manager and the County of any inconsistency, ambiguity, error or omission which Contractor may discover with respect to these documents before proceeding with the affected Work. The issuance, or the

express or implied approval by the County or the Project Manager of the Contract Documents or Submittals shall not relieve any such approval by evidence of Contractor's compliance with the Contract. The County has requested the Project Manager to provide to Contractor documents for the Project, including the Drawings and Specifications for the Project, which are accurate, adequate, consistent, coordinated, and sufficient for construction. HOWEVER, THE COUNTY MAKES NO REPRESENTATION OR WARRANTY OF ANY NATURE WHATSOEVER TO CONTRACTOR CONCERNING SUCH DOCUMENTS. By the execution hereof, Contractor acknowledges and represents that it has received, reviewed and carefully examined such documents, has found them to be complete, accurate, adequate, consistent, coordinated and sufficient for construction, and that Contractor has not, does not, and shall not rely upon any representation or warranties by the County concerning such documents as no such representation or warranties have been or are hereby made.

1.1.6 Any dispute relating to the Contract Documents, shall be resolved through good faith efforts upon the part of the Contractor and the County. Should Contractor have any questions concerning interpretation or clarification of the Contract Documents, Contractor shall submit to the County's Project Manager, in writing, a request for clarification that clearly and concisely sets forth the issues for which such request is sought. Such request shall be submitted to the Project Manager by the Contractor within three (3) business days of receipt of the Contract Documents, or the direction, interpretation, or clarification thereof provided by the County. The County's Project Manager shall render a determination concerning such interpretation or clarification, which shall be considered final and conclusive unless Contractor files a written protest within fourteen (14) calendar days of receipt thereof. Contractor's protest shall be submitted to the Purchasing Director, and shall state clearly and in detail the basis thereof. Failure by the Contractor to protest the County Project Manager's rendered determination within the timeframe above, shall constitute a waiver by the Contractor of all its rights to further protest, judicial, or otherwise. The Purchasing Director shall consider the Contractor's protest and shall render a decision thereon, in writing, within ten (10) calendar days. If Contractor does not agree with the determination of the Purchasing Director, the Contractor shall deliver written notice to that effect to the County within three (3) business days of receipt of the determination by the Purchasing Director.

1.1.7 Unless otherwise directed in writing, Contractor shall at all times carry on with the Work and maintain its progress schedule in accordance with the requirements of the Contract and the determination of the County, pending resolution of any Contract Document dispute. In no event will a dispute, the filing of a protest, claim or appeal, or the resolution or litigation thereof, relieve Contractor from its obligation to timely perform the Work required by the Contract and to maintain the progress schedule in accordance with the Contract.

1.1.8 Any and all Contract Documents shall remain the property of the County. Contractor is granted a limited license to use and reproduce applicable portions of the Contract Documents issued by the County appropriate to, and for use in, execution of the Work. Contractor shall have the right to keep one record set of the Contract Documents upon completion of the Work; provided, however, that in no event shall Contractor and/or its subcontractors use, or permit to be used, any or all of such Contract Documents on other projects without the specific written consent of the County.

1.2 Definitions

Terms used within this Agreement shall have the meaning as set forth in the St. Johns County Purchasing Policy, or as provided herein. Terms defined herein for specific application to this Contract shall govern over definition of terms provided in the St. Johns County Purchasing Policy.

1.2.1 Acceptance of the Work: Written acceptance of the Work by the County and the County's Project Manager.

1.2.2 Applicable Laws: All local, state, and federal laws, statutes, codes, ordinances, rules and regulations in effect at the time Work and Warranty Work is performed under this Contract.

1.2.3 Claim: Any claim, liability, loss, demand, demand for arbitration, damage, lien, cause of action of any kind, obligation, responsibility, cost, expense, royalty, fee, assessment, penalty, fine, judgment, interest or award, pending or threatened, whether arising by law, contract, tort, voluntary settlement or otherwise.

1.2.4 Contract Price: The sum set forth in Article IV of this Contract shall constitute the Contract Price, as may be amended by Change Order. Unless otherwise approved by the County in writing, the Contract Price includes all taxes, including without limitation, income and withholding tax of any kind and sales tax imposed by the state or by the County and paid by Contractor or any Subcontractors with respect to sales of goods purchased for the performance of the Work.

1.2.5 Contract Time: The number of calendar days between commencement and completion of the Work, established in paragraph 3.1.1 of this Contract, as may be amended by Change Order.

1.2.6 Design: Those design services related to the Project prepared by the County or the County's consultants or other representatives, which shall, as may be required, be included in Contractor's Work.

1.2.7 Drawings: The graphic and pictorial portions of the Contract Documents, illustrating the design, location and dimensions of the Work, generally including but not limited to, plans, elevations, sections, details, general notes, schedules and diagrams.

1.2.8 Final Completion: Completion of all Work in compliance with the Contract Documents, as determined by the County, and issuance of a Final Certificate for Payment.

1.2.9 Force Majeure Events: Those events that are not reasonably foreseeable and are beyond the control of both the Contractor and the County, including acts of war, terrorist attacks, labor strikes, floods, earthquakes, epidemics, pandemics, riots, adverse weather conditions, and other acts of God.

1.2.10 Jobsite: Any physical location or other place on, under, in, at or through which any aspect of the Work is performed.

1.2.11 Notice to Proceed: A written notice given by the County to Contractor fixing the date on which the Contract Time will commence to run and identifying the corresponding Substantial Completion and Final Completion dates.

1.2.12 Product Data: Illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by Contractor to illustrate materials or equipment for some portion of the Work.

1.2.13 Project: The total undertaking to be accomplished for County by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

1.2.14 Project Manager: The County's representative assigned to the Project, or any part thereof, to observe the Work and perform certain other obligations of the County as defined in Article VI below.

1.2.15 Shop Drawings: Drawings, diagrams, schedules, and other data specially issued for the Work by Contractor or a Subcontractor, Sub-subcontractor, and material suppliers to illustrate some portion of the Work.

1.2.16 Specifications: That portion of the Contract Documents consisting of the written requirements for materials, standards, equipment, construction systems, and standards of workmanship for the Work, and performance of related services.

1.2.17 Subcontractor: A Subcontractor is an individual, partnership, corporation, association, joint-venture or any combination thereof, which has a direct or indirect contract with Contractor to perform a portion of the Work.

1.2.18 Substantial Completion: The stage in the progression of the Work when the Work is sufficiently complete in accordance with this Contract so that the County can enjoy beneficial use or occupancy of the Work and can utilize the Work for its intended purpose.

1.2.19 Work: Construction and services required by the Contract Documents, including all labor, materials, equipment and services as well as other deliverables provided, or to be provided, by Contractor to fulfill Contractor's obligations under this Contract. The Work may constitute the whole or part of the Project.

1.3 Ownership of Contract Documents

Any and all Contract Documents shall remain the property of the County. Contractor is granted a limited license to use and reproduce applicable portions of the Contract Documents issued by the County appropriate to, and for use in, execution of the Work. Contractor shall have the right to keep one record set of the Contract Documents upon completion of the Work; provided, however, that in no event shall Contractor and/or Contractor's subcontractors use, or permit to be used, any or all

of such Contract Documents on other projects without the specific written consent of the County.

ARTICLE II THE WORK

2.1 Project Description

To furnish all labor, materials, equipment, and incidentals required to access site and construct a new treatment building to include new Reverse Osmosis (RO) feed pumps, RO skids, high service pumps, clean-in-place tank and pump, anti-scalant tank and skid, electrical room and gear, air conditioning, restroom and storage. In addition to the building, the project will include demolition of the existing treatment building and existing rectangular storage tank, new transformer and pad, generator, new plant control system and integration to SCADA, relocation of sodium hypochlorite tank and skid, site grading and drainage, and yard piping modifications as shown on the Drawings and as specified herein.

2.2 Labor and Materials

2.2.1 Contractor shall perform all of the Work required, implied, or reasonably inferable from, the Contract Documents. Unless otherwise provided in the Contract Documents, Contractor shall provide and pay for all labor, supervision, materials, supplies, tools, transportation, storage, construction equipment and machinery, utilities (including but not limited to water, heat, fuel, light, and cooling), and all other services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work. Materials, articles and equipment furnished by Contractor for incorporation into the Work shall be new unless otherwise specified in the Contract Documents.

2.2.2 Contractor shall use only competent and skilled personnel to perform and supervise the Work and shall remove from such Work any person determined to be unfit, unqualified, or acting in violation of any obligation of Contractor under this Contract. In the event a person is removed from the Work, Contractor shall promptly replace such individual with another who is fully competent and skilled to perform the Work at Contractor's sole expense.

2.2.3 Except as otherwise required for the safety or protection of persons or the Work or property at the Jobsite or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Jobsite shall be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with the County's prior written consent, which will not be unreasonably withheld.

2.2.4 In addition, when the Work requires by Florida Statute, Contractor shall use only licensed, registered and/or certified personnel to perform the Work. Such Statutes may include, but are not limited to, Chapter 489 (Regulation of Professions and Occupations Contracting) and Chapter 633, Part III (Fire Protection and Suppression) of the Florida Statutes.

2.3 Project Sequencing/Arrangement

Contractor shall not be limited in the sequencing or staging of the Work except to the extent that the Contract Documents impose limitations. Neither the organization of any of the Contract Documents into divisions, sections, paragraphs, articles, (or other categories), nor the organization/arrangement of the Drawings or Design, shall control Contractor in dividing the Work or in establishing the extent or scope of Work to be performed by Subcontractors.

2.4 Payment of Costs

Except as otherwise expressly provided, Contractor shall pay directly all costs and expenses of the Work of any kind or nature whatsoever including but not limited to all costs of permitting, regulatory compliance, obtaining and maintaining required bonds and insurance pursuant to Article XIII, payments due to Subcontractors and suppliers, legal, financial, sales, use and similar taxes on materials and equipment, transportation and storage of materials and equipment, preparation of schedules, budgets and reports and all other costs required to achieve Substantial Completion and Final Completion in accordance with the Contract Documents.

2.5 Cleaning the Jobsite

Contractor shall keep the Jobsite neat, secure and orderly during performance of the Work and shall clean up and remove all waste, rubbish and construction debris from the Jobsite as they accumulate. Upon Final Completion of the Work, Contractor shall remove all waste, rubbish and construction debris from and about the Jobsite as well as all tools, appliances, construction equipment, temporary utilities, temporary construction and machinery and surplus materials. Contractor shall restore to original condition all property not designated for alteration by the Contract Documents.

2.6 Reporting Requirements

2.6.1 Daily Record. The Contractor shall keep a daily record of the Work at the Jobsite. At a minimum the Daily Record shall include weather conditions, number of workers (by trade) on the Jobsite, and material/equipment deliveries. Daily Records shall be submitted by close of business the following day.

2.6.2 Monthly Report. The Contractor shall prepare and submit a written monthly report by the tenth day of each calendar month. Monthly reports shall at a minimum describe Work completed in the prior month, planned Work for the current month, detailed explanations of any activity that is behind schedule, corrective actions taken to recover schedule, safety and environmental incidents and corrective actions taken.

2.7 Title and Risk of Loss

Title to the structures, improvements, fixtures, machinery, equipment and materials constituting the Work or the Project shall pass to the County no later than time of payment. Such transferred title shall in each case be good, free and clear of any and all security interests, liens or other encumbrances. Contractor shall, however, bear all risk of loss concerning such structures, improvements, fixtures, machinery, equipment and materials until Substantial Completion, regardless of the extent to which the loss was insured or the availability of insurance proceeds. The transfer of title does not imply acceptance by the County nor does it relieve Contractor from the responsibility for any loss or damage to items.

2.8 Access to Work

The County and the Project Manager, shall at all reasonable times have full access to all parts and locations of the Jobsite(s) from commencement of the Work through Final Completion. Contractor shall take whatever steps necessary to provide such access when requested.

2.9 Utilities

Contractor shall, at its expense, make all arrangements necessary to secure the availability of and maintain all temporary utilities required to construct and operate Contractor's Work as required by the Contract Documents. If the scope of Work requires, Contractor shall arrange for activating permanent power, water, and sanitary service to the Project prior to Substantial Completion. This includes legal sketches and descriptions for easement as well as record drawings requirements required by utility companies. The County will assume permanent utility costs at Substantial Completion.

2.10 Existing Utility Lines

2.10.1 When existing Utility Lines (e.g. conduits, pipelines, transmission mains and utility equipment and appurtenances) shown on the Drawings are to be removed or relocated, Contractor shall notify the Project Manager in ample time (but in no event less than five (5) business days) for taking measures for prevention of the interruption of any required services prior to the beginning of operations. Locations of existing utility lines shown on the Drawings are based on the best information available to the Project Manager, but shall not be considered exact either as to location or number of such lines.

2.10.2 Contractor shall protect Utility Lines constructed under terms of the Contract and those discovered or shown on Drawings to be existing. In the event that Contractor damages any existing Utility Lines, shown or not shown on the Drawings, Contractor shall immediately notify the Project Manager. Damage occurring to existing Utility Lines due to Contractor's failure to exercise reasonable care shall be repaired or replaced at no cost to the County.

2.11 Taxes

2.11.1 Contractor shall pay all taxes, levies, duties and assessments of every nature which may be applicable to any Work under this Contract. The Contract Price and any agreed variations thereof shall include all applicable taxes imposed by law. Contractor shall make any and all payroll deductions required by law. Contractor herein indemnifies and holds the County harmless from any liability on account of any and all such taxes, levies, duties, assessments and deductions. The indemnity provision of this section shall survive the expiration or earlier termination of this Contract. Contractor may not use County's tax-exempt status unless specifically authorized in writing in advance.

2.11.2 Foreign Entity Tax Withholding. Amounts due to certain foreign persons or entities may be subject to backup withholding taxes under federal law. If Contractor is a foreign person or entity that is required to complete Internal Revenue Service ("IRS") Form W-8ECI, Contractor shall provide County a copy of Contractors current Form W-8ECI prior to issuance of any invoice or payment under this Contract. If Contractor fails to timely provide a completed, current Form W-8ECI, County will withhold all backup withholding taxes from the amounts due to the Contractor, remit such sums to the IRS, and pay Contractor only the remainder. County makes no representation regarding the tax treatment of amounts due to

Contractor, and Contractor releases and holds the County harmless from any claims or damages in any way relating to or arising from any tax withholding by County pursuant to this section.

2.12 Publicity and Advertising

2.12.1 Contractor shall not make any announcement or release any information or publish any photographs concerning this Contract, the Work or the Project or any part thereof to any member of the public, press or any official body, unless prior written consent is obtained from the County.

2.12.2 Use of the County Seal or County Logo is strictly prohibited. In accordance with, County Ordinance 92-2 and County Administrative Policy 101.3, Contractor may not manufacture, use, display, or otherwise use any facsimile or reproduction of the County Seal or Logo without express written approval of the Board of County Commissioners of St. Johns County, Florida.

2.13 County Furnished Items

2.13.1 The County shall furnish to Contractor, at the time of executing this Contract, written and tangible material concerning conditions below ground at the Jobsite. Such written and tangible material is furnished to Contractor only in order to make disclosure of such material and for no other purpose. By furnishing such material, the County does not represent, warrant, or guarantee its accuracy either in whole, in part, implicitly, or at all, and shall have no liability therefore. The County shall also furnish surveys, legal limitations and utility locations (if known), and a legal description of the Project's Jobsite.

2.13.2 Contractor shall obtain and pay for all permits, fees and licenses necessary and ordinary for the performance of the Work. Excluding such permits, fees and licenses, the County shall obtain all approvals, easements, and the like required for construction.

2.13.3 Subject to Paragraph 1.6 above, the County shall furnish Contractor electronic copies of the Contract Documents for execution of the Work. Hard copies of the Contract Documents shall be the responsibility of Contractor.

ARTICLE III CONTRACT TIME

3.1 Contract Time

3.1.1 Contractor shall commence the Work within ten (10) calendar days following receipt of the County's Notice to Proceed and shall substantially complete all Work within **Four Hundred Twenty (420)** consecutive calendar days as may be extended pursuant to Paragraph 9.2 of this Contract. Final Completion shall be reached within **Thirty (30)** consecutive calendar days after Substantial Completion.

3.1.2 Contractor, prior to commencing the Work, shall submit to the Project Manager for his/her information, Contractor's schedule for completing the Work. Contractor's schedule shall be revised no less frequently than monthly (unless the parties otherwise agree in writing), and relate to the entire Work. By way of illustration and not exclusion, Contractor's schedule shall: (1) contain sufficient activities to assure adequate planning for the Work, (2) include approved changes to the Work that impact the schedule, (3) include a clearly defined critical path, and (4) include a unique description for each activity. In the event any schedule revision impacts the completion time as provided in Paragraph 3.1.1 above, Contractor shall submit a request for additional time, in accordance with procedures as provided in Paragraph 9.2 below. Failure by Contractor to strictly comply with the provisions of this Paragraph shall constitute a material breach of this Contract.

3.2 Time is of the Essence

Time is of the essence regarding each and every obligation of Contractor under this Contract. Each obligation is deemed material, and a breach of any such obligation (including a breach resulting from untimely performance) is a material breach.

3.3 Substantial Completion

3.3.1 When Contractor considers the Work is substantially complete, Contractor shall notify the Project Manager in writing and submit a comprehensive list of incomplete items to be completed or corrected prior to Final Completion. The Project Manager will promptly inspect the Work following receipt of Contractor's notice and attached list of incomplete items. The Project Manager may refuse to inspect the Work if the Work is obviously not substantially complete or when Contractor s list is not complete.

3.3.2 To the extent applicable to Contractor's specific Work scope, the following items shall be completed prior to Contractor's request for a Substantial Completion inspection.

a) All general construction completed.
b) Project Jobsite cleared of Contractor's excess equipment, storage shacks, trailers, and/or building supplies.
c) Project record Drawings and Specifications submitted in accordance with the Contract Documents.
d) Preliminary as-built drawings submitted.
e) All applicable permits required for use provided.
g) All operations and maintenance manuals, training literature, and software for all equipment provided.
h) Manufacturers' certifications and warranties provided.
i) All required spare parts and special tools provided.

3.3.3 If Substantial Completion is not obtained at the inspection called by Contractor, for reasons which are the fault of Contractor, the cost of any subsequent inspections requested by Contractor for the purpose of determining Substantial Completion shall be the responsibility of Contractor and shall be assessed against the final payment application.

3.3.4 Once Substantial Completion is achieved and within the time allowed by F.S. 218.70 et seq, the Project Manager will prepare the punch list required by the Local Government Prompt Payment Act. Unless otherwise mutually agreed, the punch list items shall be corrected by Contractor within thirty (30) calendar days and prior to any request for Final Inspection and Acceptance. The failure to include any corrective Work or pending items not yet completed on the list does not alter the responsibility of Contractor to complete the Work pursuant to this Contract.

3.4 Final Inspection

When all the Work is finally complete and Contractor is ready for a final inspection, Contractor shall provide written notice to the County and the Project Manager. The Project Manager, with Contractor's cooperation, will conduct such reviews, inspections and tests as may be reasonably required to satisfy the County that the Work, or identified portion of the Work, conforms to all requirements of the Contract Documents. If the Project Manager determines that the Work or any part of the Work is not complete or fails to conform to the Contract Document requirements, Contractor will be notified in writing of deficiencies. After correcting all deficiencies Contractor shall again initiate the procedures for final inspection as set forth above. The Project Manager will issue a Final Certificate for Payment following satisfactory inspection of the Work provided Contractor has delivered to the Project Manager the final corrected as-built Drawings and the final bill of materials, if any.

3.5 Liquidated Damages

3.5.1 Execution of this Contract by Contractor shall constitute Contractor's acknowledgment that the County will sustain damages in the amount identified in Paragraph 3.5.2 below for each and every calendar day during which completion of the Work required is delayed beyond Substantial Completion or Final Completion. Contractor and County agree that such damages shall be presumed to be the damages actually sustained by the County as defined below, and that because of the nature of the Project, it would be impracticable or impossible to determine or extremely difficult to fix the actual damages.

3.5.2 If Contractor fails to achieve Substantial Completion, the County shall be entitled to withhold from any amounts otherwise due Contractor or to be paid as a debt due the sum of Two Thousand Three Hundred Seventy-Six Dollars and Zero Cents **($2,376.00)** per day and Two Thousand One Hundred Ninety-Six Dollars and Zero Cents **($2,196.00)** per day for failing to reach Final Completion each and every calendar day of unexcused delay "Liquidated Damages". The parties agree that such Liquidated Damages are not a penalty but rather a genuine pre-estimate of monetary damages sustained by the County for loss of revenue and/or increased project administration expenses related to this Contract because Contractor failed to perform and complete Work within the time fixed for completion or additional time granted pursuant to the provisions hereof. The assessment of Liquidated Damages are without prejudice to the County's rights of termination and Contractor's obligation to complete the Work.

3.5.3 Should Contractor fall behind the approved Work schedule; the County reserves the right to deduct Liquidated Damages based on an estimated period of late completion. The County need not wait until completion of Work to withhold Liquidated Damages from Contractor's progress payments.

3.6 Disclaimer of Consequential Damages

The County shall not be liable to Contractor, whether in contract, tort, warranty or under any statute or on any other basis, for any consequential, incidental, indirect, special, punitive or exemplary damages suffered or incurred by Contractor in connection with this Contract, even if the County has been advised of the possibility of such damages. Consequential damages shall include, by way of example and without limitation, opportunity costs, loss of use of facilities or other assets, consequential damage claims of subcontractors, lost profits, lost savings, lost business, lost bonding capacity, lost financing, lost reputation or lost goodwill.

ARTICLE IV CONTRACT PRICE AND PAYMENT

4.1 Contract Price

4.1.1 This Contract is a LUMP SUM Contract. As compensation for satisfactory performance of the Work, the County shall compensate, and Contractor shall accept, as full and complete compensation for all the Work required herein a total Lump Sum price of **Six Million Nine Hundred Seventy-Six Thousand Four Hundred Dollars and Zero Cents ($6,976,400.00)**, the "Contract Price". The Contract Price includes the Lump Sum Base Bid Price of Five Million Two Hundred Ninety-Six Thousand Seven Hundred Dollars and Zero Cents ($5,296,700.00), Allowance 1 Not-to-Exceed amount of Ten Thousand Dollars ($10,000.00) for Florida Power and Light involvement, Allowance 2 Not-to-Exceed amount of Twenty Thousand Dollars ($20,000.00) for AT&T involvement and Alternate #01 Not-to-Exceed amount of One Million Six Hundred Forty-Nine Thousand Seven Hundred Dollars and Zero Cents ($1,649,700.00) for all components for a new aeration system. The cost of any item of Work not covered by a specific Lump Sum shall be included in the Lump Sum price to which the item is most applicable.

4.1.2 If required by the County, Contractor shall have included unit prices in the base Lump Sum. Such unit prices shall apply to revisions to the Work as directed by the County in accordance with Article IX. Unit prices are "all-inclusive", including labor, material, supervision, tools, equipment, insurance, taxes, fringe benefits, coordination, engineering, overhead, profit, performance and payment bonds, and all other things necessary. Unit prices are fixed for the duration of the Contract and are not subject to escalation for any cause.

4.2 Schedule of Values

4.2.1 Prior to the commencement of Work, Contractor shall submit to the County and to the Project Manager a Schedule of Values allocating the Contract Price to the various portions of the Work. Contractor's Schedule of Values shall be prepared in such form, with such detail, and supported by such data as the Project Manager or the County may require to substantiate its accuracy. Contractor shall not imbalance the Schedule of Values nor artificially inflate any element thereof. The violation of this provision by Contractor shall constitute a material breach of this Contract.

4.2.2 Upon approval by the County the Schedule of Values shall be used as a basis for Contractor's Application for Payment. The total of all payments in the Schedule of Values must at all times be equal to the Contract Price. No progress payment shall be made to Contractor until an acceptable Schedule of Values is submitted.

4.2.3 General conditions costs may be considered as a line item for the following items (break down required) (collectively the following shall be known as the General Conditions Costs):

a) Contractor's field office personnel (full-time on-site)
b) Construction office and storage facilities
c) Utilities required to sustain field office and sanitary facilities
d) Electrical power and water for construction
e) Bonds and Insurance

4.2.4 Progress payments for general conditions costs will be based on the percentage of Work completed to date, except bonds and insurance which may be requested in full. Separate payments for Shop Drawings and deposits for materials will not be allowed.

4.3 Measurement and Payment

4.3.1 Contractor shall make all surveys necessary for determining all quantities of Work to be paid under this Contract. Copies of field notes, computations and other records made by Contractor for the purpose of determining quantities shall be furnished to the Project Manager upon request. Contractor shall notify the Project Manager prior to the time such surveys are made. The Project Manager may but shall have no obligation to witness and verify such surveys. Measurements and

computations shall be made by such methods as the County may consider appropriate for the class of work measured. The dividing limits, lines or planes between adjacent items or classes of excavation, concrete, or other types of Work where not definitely indicated on the Drawings or in the Specifications shall be as determined by the County.

4.3.2 No payments of invoices (or portions thereof) shall, at any time, constitute approval or acceptance of the Work under this Contract, nor be a waiver by the County of any of the terms contained herein.

4.4 Progress Payments

4.4.1 Prior to Contractor's submittal of the initial Application for Payment, Contractor shall have delivered the following documents. The County will not make any payment to Contractor until Contractor has submitted the following requirements:

a) Schedule of Values
b) Project Schedule
c) Certified copy of recorded bond
d) Insurance Certificates

4.4.2 On or before the tenth (10th) day of each calendar month, Contractor shall submit an Application for Payment to the Project Manager in such form and manner, and with such supporting data and content, as the Project Manager may require. Such Application for Payment shall be based on the amount of Work done or completed during the payment period which is defined as the first day of the preceding calendar month through the last day of the preceding calendar month. The Project Manager will review the Application for Payment to determine whether the quantity and quality of the Work is as represented in the Application for Payment and thereafter confirm to the County the amount properly owing to Contractor. Upon receipt by the County of the Project Manager's recommendation for payment, payments will be made in accordance with the Local Government Prompt Payment Act (Sections 218.70-218.80 of the Florida Statutes) less such amounts, if any, otherwise owing by Contractor to the County or which the County shall have the right to withhold. Any Application for Payment determined by the County not to be suitable for payment shall be modified and processed in accordance with the County's assessment.

4.4.3 In the event any dispute with respect to any payment or Application for Payment cannot be resolved between Contractor and the County's Project staff, Contractor may demand in writing a meeting with and review by the County's Purchasing Director. Such meeting and review shall occur within ten (10) business days of receipt by the County of Contractor's written demand. The Purchasing Director shall issue a written decision on the dispute within ten (10) business days of such meeting. This decision shall be deemed the County's final decision for the purpose of the Local Government Prompt Payment Act.

4.4.4 The County may withhold from each progress payment made to Contractor an amount not to exceed five (5%) percent of payment as retainage until final acceptance of all Work in accordance with Section 255.078 of the Florida Statues. Any interest earned on retainage shall accrue to the benefit of the County. The County shall make prompt payment to Contractor, unless in accordance with Section 255.078(6) of the Florida Statutes, such funds are the subject of a good faith dispute, claim or demand by the County or Contractor.

4.4.5 Contractor warrants and guarantees that title to Work, materials, and equipment covered in any Application for Payment, whether incorporated in the Project or not, shall pass to the County no later than the time of payment and shall be free and clear of liens, claims, security interests or other encumbrances.

4.5 Application for Payment

4.5.1 Contractor may make Application for Payment, at intervals of not more than once a month for Work satisfactorily completed during the Project. Contractor shall submit with each Application for Payment an updated Project schedule acceptable to the Project Manager. Each Application for Payment shall clearly include:

a) Contract Number;
b) A unique Application for Payment number;
c) Contractor's legal name and address;
d) Taxpayer identification number (Contractor's federal employer identification number);
e) Brief description of the completed Work, in accordance with Contractor's Schedule of Values;

f) Original Contract Price including approved Change Order amounts; and,
g) Preferred remittance address, if different from the mailing address.

The County may require any other information from Contractor that the County deems necessary to verify Contractor's Application for Payment. No later than ten (10) days after execution of this Contract or Notice to Proceed has been issued, the County will identify in a separate written notice the submittal requirements for Contractor's payment requests.

4.5.2 Delivered, stored or stockpiled materials may be included in an Application for Payment provided Contractor meets the following conditions:

a) Materials are suitably and securely stored at the Jobsite or a bonded warehouse (acceptable to the County);
b) An applicable purchase order or supplier's invoice is provided listing the materials in detail, cost of materials and identifying this specific Project by name; and
c) The material is insured against loss or damage (from whatever source) or disappearance prior to incorporation into the Work.

4.5.2.1 Payments for such materials shall be at the sole discretion of the Project Manager, shall be based only upon the actual cost of the materials to Contractor, and shall not include any overhead or profit to Contractor.

4.5.3 Each Application for Payment shall be signed by Contractor and shall constitute Contractor's representation that the Work has progressed to the level for which payment is requested, that the Work has been properly installed or performed in full accordance with this Contract, and that Contractor knows of no reason why payment should not be made as requested. Contractor's final Application for Payment shall also be accompanied by a full and complete release and/or waiver of all liens complying with Section 713.20 of the Florida Statutes.

4.5.4 Contractor must remit undisputed payment due for labor, services, or materials furnished by Subcontractors and suppliers hired by Contractor, within ten (10) days after receipt of each progress payment from the County pursuant to Section 218.735 of the Florida Statutes. If necessary for the protection of the County, the County shall have the right, at its sole option, to make payment by joint check or by direct check to Contractor's Subcontractors or suppliers without advance notice to or consent of Contractor. If joint checks are issued following claims by Contractor's Subcontractors or suppliers, the County shall be entitled to an administrative fee of $50.00 per check for the expense of processing each joint check. Any amounts paid directly to a Subcontractor or supplier will be deducted from payments made to, or amounts due or that may become due to, Contractor. The issuance of a joint check shall create no rights in favor of any person or entity beyond the right of the named payees to payment of the check and shall not be deemed to commit the County to repeat the procedure in the future.

4.5.5 No progress payment, nor any use or occupancy of the Project by the County, shall be interpreted to constitute approval or acceptance of any Work under this Contract, nor be considered a waiver by Contractor of any of the terms of this Contract.

4.5.6 The County's performance and obligation to pay under this Contract is contingent upon an appropriation of lawfully available funds by the Board of County Commissioners. The County shall promptly notify Contractor if the necessary appropriation is not made.

4.6 Withheld Payment

4.6.1 The County may decline to make payment, may withhold funds otherwise payable and, if necessary, may demand the return of some or all of the amounts previously paid to Contractor, if:

a) Any Claims are made against Contractor by the County or third parties, including Claims for liquidated damages or if reasonable evidence indicates the probability of the making of any such Claim;
b) Any Claims are made against the County, the County's property or any other party indemnified hereunder which is or might be covered by Contractors Indemnification obligations under Section 12.2 below;
c) Contractor fails to pay Subcontractors or others in full and on-time;
d) Contractor fails to submit schedules, reports, or other information required under the Contract;
e) Contractor fails to diligently prosecute the Work and maintain progress to assure completion within the Contract Time;

f) Contractor persistently fails to fully and timely perform the Work in accordance with the Contract Documents;
g) Defective or nonconforming Work is not remedied; or
h) Contractor is in default of any other representation, warranty, covenant or performance obligation of this Contract.

4.6.2 If Claims or liens filed against Contractor or property of the County connected with performance under this Contract are not promptly removed by Contractor after receipt of written notice from the County to do so, the County may remove such Claims or liens and all costs in connection with such removal shall be deducted from withheld payments or other monies due, or which may become due, to Contractor. If the amount of such withheld payments or other monies due Contractor under the Contract is insufficient to meet such cost, or if any Claim or lien against Contractor is discharged by the County after final payment is made, Contractor and its surety or sureties shall promptly pay the County all costs (including attorney's fees) incurred thereby regardless of when such Claim or lien arose.

4.7 Final Payment

4.7.1 Upon Contractor's receipt of the Final Certificate for Payment, Contractor may submit a final invoice provided the following has been completed or submitted with such final invoice:

a) Complete all items applicable to the Work identified in Paragraph 3.3.2;
b) Complete all Work listed on the punch list prepared in accordance with Paragraph 3.3.4;
c) Consent of Surety for final payment and/or retainage;
d) Final Waiver and Release of Claim signed by Contractor;
e) Submittal of final corrected as-built (record) Drawings;
f) Settlement of Liquidated Damages, as applicable; and
g) Settlement of liens and Claims, if any.

4.7.2 Acceptance of Final Payment shall constitute a waiver of all Claims against the County by Contractor except for those Claims previously made in writing against the County by Contractor, pending at the time of Final Payment, and identified in writing by Contractor as unsettled at the time of its request for Final Payment.

4.7.3 In the event Contractor fails to make a Request for Final Payment, or to resubmit a final Application for Payment within ninety (90) days after being requested to do so, the County may deem any and all retained funds to be abandoned property and shall give notice of abandonment to Contractor. The County may set off against the final payment any amounts due to County from Contractor arising out of or under this or any other Contract or Contract between them.

ARTICLE V CONTRACTOR RESPONSIBILITIES

5.1 Performance

5.1.1 Contractor warrants that, to the best of its knowledge, there is no pending or threatened action, proceeding, or investigation, or any other legal or financial condition, that would in any way prohibit, restrain, or diminish Contractor's ability to satisfy its contractual obligations hereunder.

5.1.2 Contractor shall perform no part of the Work at any time without adequate Contract Documents or, as appropriate, approved Shop Drawings, Product Data or samples for such portion of the Work. If Contractor performs any portion of the Work where Contractor knows or should know such Work involves a recognized error, inconsistency or omission in the Contract Documents without notice to the Project Manager and the County, Contractor shall bear responsibility for such performance and shall bear the cost of correction.

5.1.3 Contractor shall perform the Work strictly in accordance with this Contract.

5.1.4 Contractor shall confine its operations to the Jobsite or such other land and areas identified in and permitted by the Contract Documents. Contractor shall assume full responsibility for any damage to any such land or area, to the County or occupant thereof, or of any adjacent land or areas, resulting from the performance of the Work. Should any Claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the Claim by other dispute resolution proceeding or at law. Contractor shall, to the fullest extent permitted by Applicable Law, indemnify and hold harmless the County, and its officers, directors, agents and employees and anyone directly or indirectly employed by them from and against Claims, costs, losses, and damages arising out

of or resulting from any Claim or action, legal or equitable, brought by any such owner or occupant against the County or any other party indemnified hereunder to the extent caused by or based upon Contractor's or a Subcontractor's performance of the Work.

5.1.5 Contractor is solely and exclusively responsible for supervising all workers at the Jobsite. Contractor shall supervise and direct the Work using Contractor's best skill, effort and attention. Contractor shall be responsible to the County for any and all acts or omissions of Contractor, its employees and others engaged in the Work on behalf of Contractor.

5.1.6 Contractor and the Work must comply with all Applicable Law and the requirements of any applicable grant agreements.

5.2 Authorized Representative

5.2.1 Prior to commencing Work, Contractor shall designate in writing a competent, authorized representative(s) acceptable to the County to represent and act for Contractor ("Authorized Representative"). Absent such written designation, Contractor's Jobsite superintendent shall be deemed Contractor's Authorized Representative and s/he shall be authorized to receive and accept any and all communications from the County or the County's Project Manager. All communications given to the Authorized Representative shall be binding upon Contractor. An Authorized Representative may be added, removed or changed upon prior written notice given pursuant to Section 14.21 titled "Written Notice".

5.2.2 At all times while performing the Work and Warranty Work, Contractor shall have one or more Authorized Representatives present on the Jobsite. Such Authorized Representative shall be capable to effectively communicate with the County or the County's Project Manager, execute and enforce applicable Contract Documents and address Jobsite safety and environmental requirements.

5.3 Environmental, Safety and Health

5.3.1 Safety and Protection. Contractor shall be solely and exclusively responsible for conducting operations under this Contract to avoid risk of harm to the health and safety of persons and property and for inspecting, supervising and monitoring all equipment, materials (whether in storage on or off the Jobsite), work practices and safety precautions (including but not limited to adequate maintenance of traffic) used in the Work to ensure compliance with its obligations under this Contract. Contractor shall provide or cause to be provided necessary training and furnish all safety construction equipment/tools, including OSHA compliant and ANSI certified personal protective equipment as appropriate and necessary for the performance of the Work, to its subcontractors of every tier and enforce the use of such training and safety construction equipment/tools.

5.3.2 Compliance. Contractor shall comply with all Applicable Laws bearing on the safety of persons or property, or their protection from damage, injury or loss including compliance with applicable permits, Project plans and approvals. To the extent allowed by law, Contractor shall assume all responsibility and liability with respect to all matters regarding the safety and health of its employees and the employees of Contractor's subcontractors and suppliers of any tier, with respect to the Work.

5.3.3 Stop Work Authority. Notwithstanding the foregoing, the County reserves the right to direct Contractor to stop Work and correct an unsafe condition at any time that any person present at the Jobsite identifies any unsafe condition or action. For this purpose only, any person at the Jobsite is authorized to act on behalf of the County.

5.3.4 Safety Representative. Prior to commencing Work, Contractor shall designate in writing a member(s) of its Jobsite construction team as its Safety Representative. Such Safety Representative shall be acceptable to the County and shall have responsibility for implementing all safety procedures, including OSHA, responsibility for the prevention of accidents, authority for monitoring safety of the Work, authority to correct unsafe conditions or acts by its employees or Subcontractors, the ability to oversee compliance with and address environmental requirements, and coordinate with other on-site contractors and subcontractors on safety and environmental matters required for the Work. In the absence of the required written designation, this person shall be Contractor's Superintendent.

5.3.5 Safety Reporting Requirements. Contractor shall maintain accident and injury records as required by Applicable Law. Such records will be made available to the County upon request. Contractor shall immediately report to the County any death, injury or damage to property incurred or caused by Contractor's employees and employees of Contractor's subcontractors and suppliers of any tier.

5.3.6 Drug Free Workplace. By signing this Contract, Contractor agrees to maintain a healthy and productive workforce and safe working conditions thru compliance with the Drug-Free Workplace Act (Chapter 112, Florida State Statutes). Contractor's personnel shall not possess, use, manufacture, distribute or be under the influence of while on the Jobsite (or any other location where the provisions of this Contract applies) alcoholic beverages and/or illegal drugs or any other "Drug" as such term is defined in the Drug-Free Workplace Act.

5.3.7 Occupational Safety and Health Act (OSHA). Contractor warrants that all materials, equipment, services, etc., delivered or provided to the County shall conform in all respects to the standards set forth in the Occupational Safety and Health Act (OSHA) of 1970 as amended and the failure to comply will be considered a breach of this Contract. Contractor further certifies that if material, equipment, service, etc., delivered or provided to the County is subsequently found to be deficient in any OSHA requirement in effect on date of delivery or service fulfillment date, all costs necessary to bring the material, equipment, service, etc., into compliance with the aforementioned requirements shall be borne by Contractor.

5.3.8 Toxic Substances/Federal Hazard Communication "Right to Know and Understand" Regulations
The Federal "Right to Know and Understand" Regulation (also known as the Hazard Communication / Globally Harmonized System of Classification and Labeling of Chemicals (GHS) implemented by OSHA requires employers to inform their employees of any toxic substances to which they may be exposed in the workplace, and to provide training in safe chemical storage, labeling, handling practices and emergency procedures.

5.3.8.1 Accordingly, Contractor is required to provide completed Safety Data Sheets (SDS) for each hazardous substance provided to the County under this Contract. This includes hazardous substances that are not directly included in the Contract Documents, but are included in the goods or services provided by Contractor to the County. The SDS for each substance must be sent to the County's Project Manager and must also be sent to:

St. Johns County, a political subdivision of the State of Florida
4040 Lewis Speedway
St. Augustine, FL 32084
Attn: Risk Management

5.3.8.2 In the event that hazardous material is improperly handled or stored by Contractor, its subcontractors, any sub-subcontractors, or any employee or agent of any of the aforementioned which results in contamination of the Jobsite, Contractor shall immediately notify the County and the appropriate governmental authority and shall take whatever action is necessary or desirable to remediate the contamination at Contractor's sole cost and expense. Further, Contractor shall indemnify and hold harmless the County from any and all cost, expense, action, or liability whatsoever resulting from such contamination and/or remedial activities. The indemnity provisions of this section shall survive the expiration or earlier termination of this Contract.

ARTICLE VI PROJECT MANAGER

6.1 Project Manager Responsibilities

6.1.1 The County shall designate as its representative a Project Manager who shall be fully acquainted with the Project. The Project Manager shall be the County's representative from the Effective Date of this Contract until final payment has been made. The Project Manager shall be authorized to act on behalf of the County only to the extent provided in this Article VI.

6.1.2 The County and Contractor shall communicate with each other in the first instance through the Project Manager.

6.1.3 The Project Manager shall be the initial interpreter of the requirements of the Drawings and Specifications and the judge of the performance there under by Contractor. The Project Manager shall render written or graphic interpretations necessary for the proper execution or progress of the Work with reasonable promptness on request of Contractor.

6.1.4 The Project Manager shall review Contractor's Applications for Payment and shall confirm to the County for payment to Contractor, those amounts then due to Contractor as provided in this Contract.

6.1.5 The Project Manager shall have authority to reject Work, which is defective or does not conform to the requirements of this Contract. If the Project Manager deems it necessary or advisable, the Project Manager shall have authority to require

additional inspection or testing of the Work for compliance with Contract requirements at Contractor's expense.

6.1.6 The Project Manager shall review and accept, or take other appropriate action as necessary, concerning Contractor's submittals including but not limited to Shop Drawings, Product Data and Samples. Such review, acceptance or other action shall be for the sole purpose of determining conformance with the design concept and information given through the Contract Documents.

6.1.7 The Project Manager may authorize minor changes in the Work by field order as provided elsewhere herein. The Project Manager does not have authority to approve adjustments to the Contract Price or Contract Time. If at any time Contractor believes that acts or omissions of the County constitute a change to the Work, Contractor shall submit a written notice in accordance with the requirements of Article IX.

6.1.8 The Project Manager shall, upon written request from Contractor, conduct inspections to determine the date of Substantial Completion and the date of Final Completion, shall receive and forward to the County for the County's review and records, written warranties and related documents required by this Contract and shall issue a Final Certificate for Payment upon compliance with the requirements of this Contract.

6.1.9 The Project Manager's decision in matters relating to aesthetic effect shall be final if consistent with the intent of this Contract.

6.2 Field Orders

The Project Manager shall have authority to order minor changes in the Work not involving a change in the Contract Price or Contract Time and not inconsistent with the intent of this Contract. Such changes shall be affected by written field order and shall be binding upon Contractor. Contractor shall carry out such field orders promptly.

ARTICLE VII SUBCONTRACTORS

7.1 Award of Subcontracts

7.1.1 Contractor shall be responsible for all Work performed under the Contract Documents. All persons engaged in the Work of the Project are the responsibility and under the control of Contractor. Contractor shall furnish the Project Manager, in writing, the names of persons or entities proposed by Contractor to act as a Subcontractor on the Project. The Project Manager shall promptly reply to Contractor, in writing, stating any objections the Project Manager may have to such proposed Subcontractor. Contractor shall not enter into a Subcontract with a proposed Subcontractor with reference to whom the Project Manager has made a timely objection.

7.1.2 Contractor shall give personal attention to fulfillment of the Contract and shall keep the Work under Contractor's control. When any Subcontractor fails to execute a portion of the Work in a manner satisfactory to the County, Contractor shall remove such Subcontractor immediately upon written request from the County, and the Subcontractor shall not again be employed on the Project. The County will not entertain requests to arbitrate disputes among Subcontractors or between Contractor and Subcontractor(s) concerning responsibility for performing any part of the Work.

ARTICLE VIII CONTRACT DISPUTES/CLAIMS

8.1 Contract Claims

8.1.1 If any dispute between the County and Contractor arises under this Contract and such dispute cannot be resolved by good faith negotiations at the field level between the Project Managers of the Contractor and County, such dispute shall be promptly escalated to the Senior Representatives of the Parties, upon request of either party, who shall meet as soon as conveniently possible, but in no case later than fourteen (14) calendar days after such a request is made, to attempt to resolve such dispute or disagreement. Five (5) calendar days prior to any meetings between the Senior Representatives, the parties will exchange relevant information that will assist the parties in resolving the dispute or disagreement.

8.1.1.1 The Senior Representative for the County shall be the Director, or designee, of the County's Utilities Department.

8.1.1.2 The Senior Representative for the Contractor shall be the supervisor of the Project Manager, or a principal of the Contractor.

8.1.2 If after meeting, the Senior Representatives determine that the dispute or disagreement cannot be resolved on terms satisfactory to both parties, the Contractor s hall submit a Contract Claim as provided herein.

8.1.3 Prior to filing a Contract Claim, Contractor shall first exhaust all remedies set forth in the Contract Documents. Claims arising from this Contract shall be filed with the Purchasing Director within five (5) business days of exhausting all remedies set forth above. Pending final resolution of a dispute or claim, unless otherwise agreed in writing by both parties, the Contractor is required to proceed with performance of the Work and maintain effective progress to complete the Work within the Contract Time set forth herein. The Contract Claim shall include, at a minimum, the following:

a) The name and address of the Contractor and any legal counsel; and
b) The Contractor's address to which the County's rendered decisions shall be sent; and
c) Identification, and a copy, of the final adverse decision or document that is the subject of the Contract Claim and any exhibits, evidence or documents which the Contractor deems applicable to the issues raised in the Claim; and
d) Identification of the administrative remedies provided for in the Contract that were pursued prior to the Claim and the outcome; and
e) A statement of the grounds for each issue raised in the Contract Claim to be reviewed and the applicable provisions of the Contract, as well as any applicable Laws, or other legal authorities which the Contractor deems applicable to the Claim.

8.1.4 During the Purchasing Director's review of the Contract Claim, the Purchasing Director may request additional information from the project team of both parties. The parties must provide the requested information within the time period set forth in the request. Failure of either party to timely comply may result in resolution of the Claim without consideration of the requested information.

8.1.5 The Purchasing Director shall render a decision on the Contract Claim within twenty-one (21) calendar days of the deadline for receipt of all requested information. The written decision of the Purchasing Director shall be sent to the Contractor at the address provided in the Contract Claim, or as otherwise agreed to by the parties.

8.1.6 The decision for any Contract Claim by the Purchasing Director may be appealed by the Contractor to the County Administrator. Contractor must submit their appeal to the County Administrator, including any and all information, documentation, backup data, or other supplemental facts or figures within five (5) business days of receipt of the Purchasing Director's decision. Failure by the Contractor to submit an appeal within the prescribed timeframe shall be a waiver of a right to appeal the rendered decision. The appeal shall include any and all information, documentation, and data relative to the Contract Claim and subsequent appeal. The County Administrator shall render a decision within thirty (30) calendar days of receipt of all information. The County Administrator's decision shall be considered final, unless Contractor takes legal action in Circuit Court.

ARTICLE IX CHANGES IN THE WORK

9.1 General

9.1.1 The County may, at any time, without invalidating this Contract and without notice to sureties, direct changes in the Work within the general scope of this Contract, consisting of additions, deletions, revisions, or any combination thereof, by Change Order or by field order. Contractor agrees to promptly comply with such orders and proceed with the Work, which shall be performed under the applicable requirements of the Contract Documents. Contract Time and Contract Price will be adjusted, in accordance with Sections 9.2 and 9.3 below, by written Change Order for changes which materially increase or decrease the cost of or time for performance of the Work.

9.1.2 If at any time Contractor believes that acts or omissions of the County constitute a change to the Work, Contractor shall submit a written notice to the Project Manager explaining in detail the basis for the change request. Contractor's written notice must be furnished within five (5) days of the commencement of the event giving rise to the claim or Contractor's knowledge of the claim, and the notice shall state the general nature and cause of the claim. Thereafter, within twenty (20) days after the termination of the event giving rise to the claim or Contractor's knowledge of the claim, Contractor shall submit written notice of the extent of the claim with supporting information and documentation to the Project Manager and County. **IT IS EXPRESSLY AND SPECIFICALLY AGREED THAT ANY AND ALL CLAIMS FOR CHANGES TO THE CONTRACT TIME OR CONTRACT PRICE SHALL BE WAIVED IF NOT SUBMITTED IN STRICT ACCORDANCE WITH THE REQUIREMENTS OF THIS SECTION.** Pending final resolution of any such claim request, Contractor shall diligently proceed

with performance of this Contract regardless of any dispute concerning performance of the Work or the amount Contractor is to be paid for such Work.

9.2 Changes in the Contract Time

9.2.1 The Contract Time will be extended by Change Order in an amount equal to time lost on critical Work items due to delays beyond the control of and through no fault or negligence of Contractor if a claim for an extension is submitted in accordance with Section 9.1.2 above.

9.2.2 If Contractor is delayed in progressing any task which at the time of the delay is then critical or which during the delay becomes critical, as a direct result of unusually adverse weather conditions not reasonably anticipated, or any other causes beyond Contractor's reasonable control and not attributable to Contractor or Contractor's Subcontractor's actions or failure to act, then the date for achieving Substantial Completion of the Work may be extended for such reasonable time as the Project Manager may determine. An extension of Contract Time shall be Contractor's sole and exclusive remedy for delay unless the delay is solely caused by fraud, bad faith or active interference on the part of the County or its representatives. In no event shall Contractor be compensated for interim delays that do not extend the Contract Time.

9.2.3 Extensions to the Contract Time for delays caused by the effects of inclement weather shall be submitted as a request for a change in the Contract Time pursuant to paragraph 9.1.2 above. Time extensions are justified only when rain, other inclement weather conditions, or related adverse soil conditions result in Contractor's inability to work at least fifty percent (50%) of the normal workday on controlling items of Work identified on the accepted schedule or updates to that schedule.

9.2.4 Contractor shall, at no cost to the County, take all precautions necessary to secure the Project Jobsite from any damage that may be caused by all threatened storm events, regardless of whether the County has given notice of same. Compliance with any specific storm event precautions will not constitute additional work. Suspension of the Work caused by a threatened or actual storm event, regardless of whether the County has directed such suspension, will entitle Contractor to additional Contract Time only and shall not give rise to a claim for a change in the Contract Price.

9.3.2.5 Force Majeure Events

9.2.5.1 The Contractor shall not be held responsible for any delay or failure in performance of any part of this Contract to the extent such delay or failure is caused by a Force Majeure Event, as defined herein, so long as the Contractor's delay is not caused by the Contractor's own fault or negligence. Notwithstanding the foregoing, the Contractor cannot claim Force Majeure for any emergency, exigency, or "act of God" that is already contemplated in the Work, or any other performance by the Contractor, that is contemplated in this Contract, or that in any way existed or was reasonably foreseeable or within the control of the Contractor at the time this Contract was executed.

9.2.5.2 In order to claim delay pursuant to this provision, Contractor must notify the County, in writing, within five (5) business days of the beginning of the Force Majeure Event, which Contractor claims caused the delay or failure by the Contractor to perform under this Contract.

9.2.5.3 If Contractor's delay or failure, caused by a Force Majeure Event, extends beyond a period of thirty (30) calendar days, from the beginning of the Force Majeure Event, the County shall have the right to terminate this Contract, in accordance with the provisions of this Contract, and shall only be liable to the Contractor for any Work performed and validated (if required for payment hereunder) prior to the date of termination of this Contract.

9.2.5.4 If the Contractor's delay is confirmed by the County to be caused by a Force Majeure Event, the County may, upon written request of the Contractor, agree to equitably adjust the provisions of this Contract, including price, performance, and completion time, as may be affected by such delay. However, it is expressly understood by the Contractor that the County is not obligated to make any such adjustments to the provisions of this Contract, and shall do so only if it serves the best interest of the County. This provision shall not be interpreted to limit the County's right to terminate for convenience.

9.3 Changes in the Contract Price

9.3.1 In connection with any claim by Contractor against the County for compensation in excess of the Contract Price, any liability of the County for Contractor's costs shall be strictly limited to direct costs incurred by Contractor and shall in no event include indirect costs or consequential damages of Contractor.

9.3.2 Any change in the Contract Price resulting from a Change Order shall be determined as follows:

a) By mutual acceptance of a lump sum increase or decrease in costs. Upon the Project Manager's request, Contractor shall furnish a detailed estimate of increased or decreased costs, together with cost breakdowns and other support data as the Project Manager may reasonably request.
b) By Unit Prices stated in the Contract Documents, or subsequently agreed upon payment.
c) By a manner or method mutually agreed by the County and Contractor.

9.3.3 If no mutual agreement occurs between the County and Contractor, then the change in the Contract Price, if any, shall than be determined by the Project Manager on the basis of the reasonable expenditures or savings of those performing, deleting or revising the Work attributable to the change, including, in the case of an increase or decrease in the Contract Price, a reasonable allowance for direct job site overhead and profit. In such case, Contractor shall present, in such form and with such content as the County or the Project Manager requires, an itemized accounting of such expenditures or savings shall be limited to the following: reasonable costs of materials, supplies, or equipment including delivery costs, reasonable costs of labor, including social security, unemployment insurance, fringe benefits required by a pre-existing Contract or by custom, and workers' compensation insurance, reasonable costs of premiums for all bonds and insurance, permit fees, and sales, use or other taxes paid by Contractor that are directly attributable to the changed Work. In no event shall any expenditure or savings associated with Contractor's home office or other non-Jobsite overhead expenses be included in any change in the Contract Price. Pending final determination of reasonable expenditures or savings to the County, payments shall be made to Contractor based on the Project Manager's recommendation for payment.

9.3.4 Costs which will not be allowed or paid in Change Orders or other claims under this Contract include, but are not limited to, the costs of preparing or reviewing change request/claims or proposed Change Orders, change request/claim consulting costs; lost revenues; lost profits; lost income or earnings; interest cost of any type other than those mandated by statute; rescheduling costs; lost earnings; loss of other business; or the costs of Contractor representatives visiting the Jobsite or participating in meetings with the County. The County shall not be liable to Contractor for claims of third parties, including Subcontractors, unless and until liability of Contractor has been established therefore in a court of competent jurisdiction.

9.3.5 In the event there is an unforeseeable increase to the cost of project materials during the course of this Contract, which exceeds twenty percent (20%), the Contractor must provide documentation demonstrating the original amount of the quoted materials, the updated quote for materials, and two (2) or more additional quotes from alternate sources for the materials demonstrating the Contractor is providing the best value to the County. The County will review the information provided in accordance with Article IX.

9.4 Acceptance of Change Orders

Contractor's written acceptance of a Change Order shall constitute a final and binding Contract to the provisions thereof and a waiver of all claims in connection therewith, whether direct, indirect, or consequential in nature.

9.5 Notice to Sureties

Contractor shall notify and obtain the timely consent and approval of Contractor's surety with reference to all Change Orders if such notice, consent or approval is required by Contractor's surety or by law. Contractor represents and warrants to County that Contractor is solely liable and responsible to so notify and obtain any such consent or approval. The Contractor is to provide certification from the surety that the amount of a change order has been incorporated into the bond to cover the additional scope of work and/or cost associated with the Change Order.

9.6 Differing Site Conditions

If during the course of the Work, Contractor encounters (1) subsurface or concealed conditions at the Project's Jobsite that differ materially from those shown in the Contract Documents and from those ordinarily encountered and generally recognized as inherent in work of the character called for in this Contract; or (2) unknown physical conditions of the Project's Jobsite, of an unusual nature, which differ materially from that ordinarily encountered and generally recognized as inherent in work of the character called for in this Contract, then Contractor, without disturbing the conditions and before performing any Work affected by such conditions, shall, within twenty-four (24) hours of their discovery, notify the Project Manager in writing of the existence of the aforesaid conditions. The Project Manager shall, within two (2) business days after receipt of Contractor's written notice, investigate the site conditions identified by Contractor. If, in the sole opinion of the Project Manager, the conditions do materially so differ and cause an increase or decrease in Contractor's cost of, or the

time required for, the performance of any part of the Work, whether or not charged as a result of the conditions, the Project Manager may recommend an equitable adjustment to the Contract Price, or the Contract Time, or both. If Project Manager and Contractor cannot agree on an adjustment in the Contract Price or Contract Time, the adjustment shall be referred to the Purchasing Director for determination in accordance with the provisions of Paragraph 1.1.6. No request by Contractor for an equitable adjustment to this Contract under this provision shall be allowed unless Contractor has given written notice to the Project Manager in strict accordance with the provisions of this Article. **No request for an equitable adjustment or change to the Contract Price or Contract Time for differing site conditions shall be allowed if made after the date certified by the Project Manager as the date of Substantial Completion.**

The failure by Contractor to provide written notice as provided in this Paragraph 9.6 shall constitute a waiver by Contractor of any Claim arising out of or relating to such concealed or unknown condition.

ARTICLE X UNCOVERING WORK, STOPPING WORK, AND ACCEPTING DEFECTIVE OR NONCONFORMING WORK

10.1 Uncovering Work

10.1.1 No Work or portion of Work shall be covered until inspected by the County as required by the Contract Documents. If any of the Work is covered contrary to the request or direction of the County or the Project Manager or contrary to the requirements of the Contract Documents, Contractor shall, upon written request, uncover it for the Project Manager's inspection and subsequently cover the Work in accordance with the Contract Documents without adjustment to the Contract Time or Contract Price. The provisions and obligations set forth herein shall apply even if the County ultimately determines (after uncovering and inspection) that the underlying Work in question conforms to the requirements of the Contract Documents.

10.1.2 Should the County wish to either (i) re-inspect a portion of the Work that has been covered by Contractor in compliance with Paragraph 9.1.1, above, or (ii) inspect a portion of the Work that has been covered by Contractor which is not required by the Contract Documents to be observed or inspected prior to its being covered and which the County did not specifically request to observe prior to its being covered, Contractor shall uncover the applicable portion of the Work upon written request. If the County determines that the Work uncovered conforms to the requirements of the Contract Documents, then the County will pay the costs of uncovering and replacement of the cover through a Change Order and will adjust the Contract Time by Change Order if the uncovering and replacement Work extends the most current Substantial Completion or Final Completion date, as applicable. If, however, the County determines that the Work uncovered does not conform to the requirements of the Contract Documents, then Contractor shall pay the costs of uncovering and replacement and shall not be entitled to an adjustment of the Contract Price.

10.2 Right to Stop Work

If the Work is defective, or Contractor fails to supply sufficient skilled workers, suitable materials, or equipment or fails to furnish or perform the Work in such a way that the completed Work will conform to the Contract Documents, the County, acting through the Project Manager, may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated. The County's right to stop Work, or any portion thereof, shall not give rise to any duty on the part of the County to exercise this right for the benefit of Contractor or any other party.

10.3 County May Accept Defective or Nonconforming Work

If the County chooses to accept defective or nonconforming Work, the County may do so. In such events, the Contract Price shall be reduced by the greater of (a) the reasonable cost of removing and correcting the defective or nonconforming Work, and (b) the difference between the fair market value of the Work had it not been constructed in such manner as to include defective or nonconforming Work. If the remaining portion of the unpaid Contract Price, if any, is insufficient to compensate the County for its acceptance of defective or nonconforming Work, Contractor shall, pay the County such remaining compensation for accepting defective or nonconforming Work.

ARTICLE XI CONTRACT SUSPENSION AND TERMINATION

11.1 Suspension

The County may, by written notice, order Contractor to suspend, delay or interrupt Work, in whole or in part, for a period of time as the County may determine. If such suspension delays Contractor's ability to meet the authorized Contract Time, Contractor will be granted an extension of time as reasonably agreed by both parties. Contractor shall not be entitled to an

adjustment to the Contract Time to the extent that performance is, was or would have been so suspended, delayed or interrupted by another cause, act or omission for which Contractor is responsible. Notwithstanding anything to the contrary in this Contract and, in the event any such suspension exceeds ninety (90) days, Contractor may, upon ten (10) days written notice to the County, terminate performance under this Contract and recover from the County an equitable adjustment in accordance with Section 9.3 above.

11.2 Termination

11.2.1 The County may by written notice to Contractor terminate the Work under this Contract in whole or in part at any time for the County's convenience or for the default of Contractor.

11.2.2 The County may terminate this Contract, in whole or in part, for its convenience upon thirty (30) calendar days written notice to the Contractor. If the termination is for the convenience of the County, an equitable adjustment in the compensation to be paid to the Contractor may be made based upon the cost for completed Work, Work in progress, and the substantiated, reasonable and actually incurred costs associated with termination, including demobilization costs and amounts due in settlement of terminated contracts with Subcontractors. No amount shall be allowed for anticipated profit or unperformed work.

11.2.3 Contractor may terminate this Contract, for any reason up to sixty (60) calendar days written notice, provided that any outstanding Work is completed by Contractor, or Contractor's Subcontractors. Contractor further agrees to cooperate fully and assist the County, upon request, in order to complete any Work under this Project. In such event, the County shall compensate the Contractor as mutually agreed in writing for any such Work after termination.

11.2.4 The County may terminate this Contract, in whole or in part, for cause (or "default"). In the event of Contractor's default, the County shall issue a Notice of Default to the Contractor, articulating the items which the County finds to be in default of the requirements of this Agreement. Contractor shall have ten (10) calendar days from receipt of the Notice of Default to remedy deficiencies or submit, in writing, an acceptable plan for remedying the deficiencies identified in said notice. If Contractor fails to remedy such deficiencies, or to submit an acceptable plan for remedying such deficiencies, to the satisfaction of the County within the stated time period, the County shall issue a Notice of Termination, and take over and prosecute the Work to completion. In such case, Contractor shall be liable to the County for all reasonable additional costs incurred by the County in completion of the Work.

11.2.5 Upon receipt of such termination notice Contractor shall immediately stop all Work and shall immediately cause any and all of its Subcontractors and material suppliers at any tier, to immediately stop all work, leaving the construction Site in a safe and secured condition. Contractor shall not be paid for any work performed or costs incurred after the termination date that reasonably could have been avoided. The County may direct Contractor to assign Contractor's right, title and interest under terminated orders or subcontracts to its designee.

11.2.6 Contractor shall not remove from the construction Jobsite any materials, equipment, plant or tools that have been paid for by County pursuant to this Contract. Contractor hereby grants the County a free and unimpeded right of access to Contractor's facilities, which shall survive any termination of the Contract, for the purpose of permitting the County to take control of and remove any Work, including but not limited to any Work for which title has vested in the County.

11.2.7 For purposes of this Termination provision, Contractor shall be deemed in default if Contractor (1) persistently or repeatedly refuses or fails to perform the Work in a timely manner, (2) fails to supply enough properly skilled Workers, supervisory personnel or proper equipment or materials, (3) fails to make prompt payment to Subcontractors, or for materials or labor, (4) becomes insolvent or becomes the subject of voluntary or involuntary bankruptcy proceedings, (5) persistently disregards laws, ordinances, rules, regulations or orders of any public authority having jurisdiction, or (6) breaches or violates a material provision of this Contract. If the termination is attributable to the default of Contractor, the County shall have the right, without prejudice to any other right or remedy, to take possession of the construction Jobsite and of all materials, equipment, tools, construction equipment and machinery thereon owned by Contractor and may finish the Work by whatever methods it may deem expedient. In such case, Contractor shall not be entitled to receive any further payment until the Work is finished.

11.2.8 If the unpaid balance of the Contract Price less any liquidated damages due under this Contract, exceeds the cost of finishing the Work, including compensation for the Project Manager's additional services and expenses made necessary thereby, Contractor shall pay the difference to the County. This obligation for payment shall survive the termination of the

Contract.

11.2.9 If, after termination by the County for Contractor's default, it is determined by a Court of competent jurisdiction that Contractor was not in default, or that the delay was excusable, the rights and obligations of the parties, including adjustment of the Contract Price, will be the same as if the termination had been issued for the convenience of the County, as provided under Paragraph 11.2.4 above.

ARTICLE XII WARRANTY AND INDEMNITY

12.1 Warranty

12.1.1 Contractor warrants and guarantees to the County that all labor furnished to progress the Work under this Contract shall be competent to perform the tasks undertaken and that the product of such labor shall yield only first-class results and that all materials and equipment furnished under this Contract shall be of good quality, free from faults and defects and in strict conformance with the Contract Documents.

12.1.2 Contractor warrants all materials, equipment and labor it furnishes or performs under this Contract against all defects in design, materials and workmanship for a period of one year (or the period of time in any guarantee or warranty provided by any manufacturer or supplier of equipment or materials incorporated into the Work, whichever is later) from and after the date of Final Completion. Contractor shall within ten (10) Days after being notified in writing by the County of any defect in the Work or non-conformance of the Work (Warranty Work), commence and prosecute with due diligence all Work necessary to fulfill the terms of the warranty at its sole cost and expense. Contractor shall act sooner as requested by the County in response to an emergency. In addition, Contractor shall, at its sole cost and expense, repair and replace any portions of the Work (or work of other contractors) damaged by its Warranty Work or which becomes damaged in the course of repairing or replacing Warranty Work. For any Work so corrected, Contractor's obligation hereunder to correct Warranty Work shall be reinstated for an additional one-year period, commencing with the date of acceptance of such corrected Work.

12.1.3 Contractor shall perform such tests as the County may require to verify that any corrective actions, including, without limitation, redesign, repairs, and replacements comply with the requirements of the Contract Documents. All costs associated with such corrective actions and testing, including the removal, replacement, and reinstitution of equipment and materials necessary to gain access, shall be the sole responsibility of Contractor.

12.1.4 All warranties and guarantees of subcontractors, suppliers and manufacturers with respect to any portion of the Work, whether express or implied, are deemed to be obtained by Contractor for the benefit of the County, regardless of whether or not such warranties and guarantees have been transferred or assigned to the County by separate Contract and Contractor agrees to enforce such warranties and guarantees, if necessary, on behalf of the County.

12.1.5 In the event that Contractor fails to perform its obligations under this Warranty Section, or under any other warranty or guaranty under this Contract, to the reasonable satisfaction of the County, the County shall have the right to correct and replace any defective or non-conforming Work and any work damaged by such work or the replacement or correction thereof at Contractor's sole expense. Contractor shall be obligated to fully reimburse the County for any expenses incurred hereunder upon demand.

12.1.6 Failure on the part of the County to reject defective, non-conforming or unauthorized Work shall not release Contractor from its contractual obligations, be construed to mean acceptance of such Work or material by the County, or, after Final Completion, bar the County from recovering damages or obtaining such other remedies as may be permitted by law.

12.1.7 No adjustment in the Contract Time or Contract Price will be allowed because of delays in the performance of the Work as a result of correcting defective, non-conforming or unauthorized Work.

12.1.8 County and Contractor agree that the provisions of Florida Statute Chapter 558 shall not apply to this Contract.

12.2 Indemnity

12.2.1 Contractor shall indemnify and hold harmless the County and its officers and employees ("Indemnified Party"), from liabilities, damages, losses and costs, including, but not limited to, reasonable attorney's fees, to the extent caused by

the negligence, recklessness, or intentional wrongful misconduct of Contractor and persons employed or utilized by Contractor in the performance of this Contract.

12.2.2 To the extent permitted by, and in accordance with Section 725.06 of the Florida Statues, Contractor further agrees that "damages, losses and costs", includes fines, citations, court judgments, insurance claims, restoration costs or other liability, to the extent caused by the negligence, recklessness, or intentional wrongful misconduct of Contractor and persons employed or utilized by Contractor in the performance of this Contract.

12.2.3 To the extent permitted by, and in accordance with Section 725.06 of the Florida Statues, for purposes of indemnity, the "persons employed or utilized by Contractor" shall be construed to include, but not be limited to, Contractor, its staff, employees, subcontractors, all deliverers, suppliers, furnishers of materials or services or anyone acting for, on behalf of, or at the request of Contractor.

12.2.4 In Claims against any person or entity indemnified hereunder by an employee of Contractor, any Subcontractor, or subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under this Section 11.2 shall not be limited by a limitation on the amount or type of damages, compensation or benefits payable by or for Contractor or any Subcontractor or subcontractor under any workers' compensation acts, disability benefits acts or other employee benefit acts.

12.2.5 Contractor's indemnity and hold harmless obligations hereunder shall extend to all Claims against the County by any third party or third-party beneficiary of this Contract and all liabilities, damages, losses and costs related thereto.

12.2.6 This indemnification will not be valid in the instance where the loss is caused by the gross negligence, or willful, wanton or intentional misconduct of any Indemnified Party.

12.2.7 If any provision(s), or portion(s) of a provision(s) of this Section, or the application thereof to any person or circumstance shall, to any extent, be held to be invalid, illegal or unenforceable for any reason whatsoever, the validity, legality and enforceability of the remaining provision(s), or part of the provision(s), shall not in any way be affected or impaired thereby; and shall be interpreted to the fullest extent possible to be enforceable and to give effect to the intent manifested by the provision(s), or portion(s) thereof, held invalid, illegal or unenforceable.

12.2.8 Contractor shall further indemnify and hold harmless the County its officers and employees from and against all Claims arising out of any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents and shall defend such Claims in connection with any alleged infringement of such rights.

12.2.9 The indemnification provisions of this Section 12.2 shall survive expiration or earlier termination of this Contract.

ARTICLE XIII INSURANCE AND BONDS

13.1 Contractor's Insurance Requirements

13.1.1 All insurance policies shall be satisfactory to the County and be issued by companies authorized and duly licensed to transact business in the State of Florida. Contractor shall furnish proof of insurance to the County prior to execution of this Contract. No Work shall commence under this Contract until Contractor has obtained all insurance coverages required under this section. Certificates of insurance shall clearly indicate Contractor has obtained insurance of the type, amount, and classification as required by this Contract. Required insurance coverage shall be maintained in force, including coverage for Additional Insureds, until Final Completion of all Work including Warranty Work.

13.1.2 No less than ten (10) days written notice shall be provided to the County prior to cancellation, non-renewal or any material change of required insurance policies. Yearly renewal certificates shall be provided to the County within thirty (30) days of expiration of the current policy.

13.1.3 The types and amounts of insurance required under this Contract do not in any way limit the liability of Contractor including under any warranty or indemnity provision of this Contract or any other obligation whatsoever Contractor may have to the County or others. Nothing in this Contract limits Contractor to the minimum required insurance coverages found in this Article XIII.

13.2 Additional Insured Endorsements and Certificate Holder

The term "Additional Insured", as used in this Contract, shall mean St. John's County, its elected officials, officers, employees, agents and representatives. Certificates of insurance shall specifically name each Additional Insured for all policies of insurance except Workers' Compensation and Professional Liability. A copy of the endorsement showing the required coverages must accompany the certificate of insurance**.**

Certificate Holder Address: St. Johns County, a political subdivision of the State of Florida
4040 Lewis Speedway
St. Augustine, FL 32084
Attn: Purchasing Department

13.3 Workers Compensation

Contractor shall procure and maintain during the life of this Contract, adequate Workers' Compensation Insurance in at least such amounts as is required by law for all of its employees per Florida Statute 440.02.

13.4 Commercial General Liability

Contractor shall procure and maintain during the life of this Contract, Commercial General Liability Insurance with minimum limits of $1,000,000 per occurrence, $2,000,000 aggregate, including bodily injury (including wrongful death), property damage, products, personal & advertising injury, and completed operations. This insurance must provide coverage for all Claims that may arise from the services and/or operations completed under this Contract, whether such services or operations are by Contractor or anyone directly or indirectly employed by them. Such insurance(s) shall also be primary and non-contributory with regard to insurance carried by the Additional Insureds.

13.5 Commercial Automobile Liability

Contractor shall procure and maintain during the life of this Contract, Commercial Automobile Liability Insurance with minimum limits of $2,000,000 combined single limit for bodily injury and property damage liability and insuring liability arising out of or in any way related directly or indirectly to the ownership, maintenance or use of any owned, non-owned or rented/hired automobiles.

13.6 Additional Coverages

ONLY THE SUBSECTIONS CORRESPONDING TO ANY CHECKED BOX IN THIS PARAGRAPH 13.6 WILL APPLY TO THIS CONTRACT.

13.6.1 ☐ Professional Liability.

13.6.1.1 Contractor shall procure and maintain, during the life of this Contract, Professional Liability or Errors and Omissions Insurance with minimum limits of $1,000,000 with 10-year tail coverage starting upon Final Completion. Contractor's professional liability policy should not have an exclusion for environmental compliance management or construction management professionals.

13.6.1.2 In the event that Contractor employs professional engineering or land surveyor services for performing field engineering or preparing design calculations, plans, and specifications, Contractor shall require the retained engineers and land surveyors to carry professional liability insurance with limits not less than $1,000,000 each claim with respect to negligent acts, errors, or omissions in connection with professional services to be provided under this Contract.

13.6.2 ☒ Builders Risk.

13.6.2.1 Contractor shall procure and maintain Builder's Risk ("all risk") insurance on a replacement cost basis. The amount of coverage shall be equal to the full replacement cost on a completed value basis, including periodic increases or decreases in values through change orders.

13.6.2.2 The Builder's Risk policy shall identify the County as the sole loss payee. The policy shall name as insured the County, Contractor and its subcontractors of every tier. Each insured shall waive all rights of subrogation against each of the other insured to the extent that the loss is covered by the Builder's Risk Insurance. The Builder's Risk policy shall be primary and any self-insurance maintained by the County in not contributory. The Builder's Risk policy shall not include a

co-insurance clause. This coverage shall not be lapsed or cancelled because of partial occupancy by the County prior to Final Completion of the Work.

13.6.2.3 The Builder's Risk insurance shall:

a. insure against at least the following perils or causes of loss: fire; lightning; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; flood; collapse; explosion; debris removal including demolition as may be reasonably necessary; and water damage (other than that caused by flood).

b. cover, as insured property, at least the following: (i) the Work and all appurtenances, materials, supplies, fixtures, machinery, apparatus, equipment and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work including County furnished or assigned property; (ii) spare parts inventory required within the scope of the Contract; and (iii) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Jobsite, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.

c. extend to cover damage or loss to insured property (i) while in transit; and (ii) while in temporary storage at the Jobsite or in a storage location outside the Jobsite (but not including property stored at the premises of a manufacturer or supplier).

d. include (i) performance/start-up and hot testing; (ii) soft costs (e.g. design and engineering fees, code updates, permits, bonds, insurances, and inspection costs); and (iii) costs of funding or financing when a covered risk causes delay in completing the Work.

13.6.4 The Builder's Risk Insurance may have a deductible clause. Contractor shall be responsible for paying any and all deductible costs. Notwithstanding anything to the contrary set forth above, the deductible for coverage of all perils and causes of loss enumerated in subparagraph 13.6.2.3 above shall not exceed $250,000.

13.7 Other Requirements

13.7.1 The required insurance limits identified in Sections 13.4, 13.5, and 13.6 above may be satisfied by a combination of a primary policy and/or Umbrella or Excess Liability Insurance policy. Contractor shall require each lower-tier subcontractor to comply with all insurance requirements appropriate for its scope of work, and any deficiency shall not relieve Contractor of its responsibility herein. Upon written request, Contractor shall provide County with copies of lower-tier subcontractor certificates of insurance.

13.7.2 Providing and maintaining adequate insurance coverage is a material obligation of Contractor. County has no obligation or duty to advise Contractor of any non-compliance with the insurance requirements contained in this Section. If Contractor fails to obtain and maintain all of the insurance coverages required herein, Contractor shall indemnify and hold harmless the Additional Insureds from and against any and all Claims that would have been covered by such insurance had Contractor complied with its obligations herein.

13.7.3 County reserves the right to adjust the above minimum insurance requirements or require additional insurance coverages to address other insurable hazards.

13.8 Payment and Performance Bonds

Contractor shall execute, furnish the County with, and record in the public records of St. John’s County, a Payment and Performance Bond in accordance with the provisions of Sections 255.05 and 287.0935 Florida Statutes, in an amount no less than the Contract Price. Such Payment and Performance Bond shall be conditioned upon the successful completion of all work, labor, services, equipment and materials to be provided and furnished hereunder, and the payment of all subcontractors, materialmen, and laborers. Said bond shall be subject to the approval of the Board of County Commissioners of St. John’s County, Florida. In accordance with Section 255.05, F.S., the County may not make a payment to Contractor until Contractor has provided the County a certified copy of the recorded bond.

ARTICLE XIV MISCELLANEOUS

14.1 Independent Contractor

Contractor represents that it is fully experienced and properly qualified, licensed, equipped, organized, and financed to perform the Work under this Contract. Contractor shall act as an independent contractor and not as an agent in performing this Contract and shall maintain complete control over its employees and all of its Subcontractors and suppliers of any tier. Nothing contained in this Contract or any lower-tier subcontract or purchase order awarded by Contractor shall create any contractual relationship between any such subcontractor or supplier and the County. Contractor shall perform all Work in accordance with the requirements of this Contract and in accordance with its own methods subject to compliance with this Contract.

14.2 Examination of Contractor's Records

The County or its authorized representative shall, until the expiration of five (5) years after final payment under this Contract, have access to, and the right to examine any directly pertinent books, documents, papers and records of Contractor involving transactions relating to this Contract, and to make copies, excerpts and transcriptions thereof. If any such examination reveals that Contractor has overstated any component of the Contract Price, Change Order, Claim, or any other County payment obligation arising out of this Contract, then Contractor shall, at the election of the County, either immediately reimburse to the County or offset against payments otherwise due Contractor, the overstated amount plus interest. The foregoing remedy shall be in addition to any other rights or remedies the County may have.

14.3 Backcharges

14.3.1 Upon the County's notification to undertake or complete unperformed Work such as cleanup or to correct defective or non-conforming services, equipment, or material (Backcharge Work), if Contractor states or by its actions indicates it is unable or is unwilling to immediately proceed and/or complete the Backcharge Work in an agreed time; the County may perform such Backcharge Work by the most expeditious means available and backcharge Contractor for any and all costs thereby incurred by the County.

14.3.2 The County shall separately invoice or deduct and retain from payments otherwise due to Contractor the costs for Backcharge Work. The County's right to backcharge is in addition to any and all other rights and remedies provided in this Contract or by law. The County's performance of the Backcharge Work shall not relieve Contractor of any of its responsibilities under this Contract and Contractor shall be responsible for the Backcharge Work as if it were its own.

14.4 Applicable Laws

Contractor and the Work must comply with all Applicable Laws and the requirements of any applicable grant agreements.

14.5 Governing Law & Venue

The Contract shall be governed by the laws of the State of Florida. Venue for any administrative and/or legal action arising under the Contract shall be St. Johns County, Florida.

14.6 Assignment

Contractor shall not sell, assign or transfer any of its rights, duties or obligations under the Contract, or under any Change Order issued pursuant to the Contract or make an assignment or transfer of any amounts payable to Contractor under the Contract, without the prior written consent of the County. In the event of any assignment, Contractor remains secondarily liable for performance of the Contract, unless the County expressly waives such secondary liability. The County may assign the Contract with prior written notice to Contractor of its intent to do so. This Contract may be assumed by and shall inure to the benefit of the County's successors and assigns without the consent of Contractor.

14.7 Severability

If a court deems any provision of the Contract void, invalid or unenforceable, that provision shall be enforced only to the extent that it is not in violation of law or is not otherwise unenforceable and all other provisions shall remain in full force and effect.

14.8 Section Headings

The section and other headings contained in this Contract are for reference purposes only and shall not affect the meaning or interpretation of this Contract.

14.9 Disclaimer of Third-Party Beneficiaries

This Contract is solely for the benefit of County and Contractor and no right or cause of action shall accrue to or for the benefit of any third party not a formal party hereto. Nothing in this Contract, expressed or implied, is intended or shall be construed to confer upon or give any person or entity other than County and Contractor, any right, remedy, or Claim under or by reason of this Contract or any provisions or conditions hereof; and all of the provisions, representations, covenants and conditions herein contained shall inure to the sole benefit of and shall be binding upon County and Contractor.

14.10 Waiver; Course of Dealing

The delay or failure by the County to exercise or enforce any of its rights or remedies under this Contract shall not constitute or be deemed a waiver of the County's right thereafter to enforce those rights or remedies, nor shall any single or partial exercise of any such right or remedy preclude any other or further exercise thereof or the exercise of any other right or remedy. The conduct of the parties to this Contract after the Effective Date shall not be deemed a waiver or modification of this Contract.

14.11 No Waiver of Sovereign Immunity

Nothing herein is intended to serve as a waiver of sovereign immunity by any agency or political subdivision to which sovereign immunity may be applicable or of any rights or limits to liability existing under Section 768.28, Florida Statutes. This section shall survive the termination of all performance and obligations under this Contract and shall be fully binding until such time as any proceeding brought on account of this Contract is barred by any applicable statute of limitations.

14.12 Execution in Counterparts

This Contract may be executed in counterparts, each of which shall be an original document, and all of which together shall constitute a single instrument. The parties may deliver executed counterparts by e-mail transmission, which shall be binding. In the event this Contract is executed through a County-approved electronic signature or online digital signature service (such as DocuSign), such execution shall be valid, effective and binding upon the party so executing. Execution and delivery of an executed counterpart of this Contract and/or a signature page of this Contract by electronic image scan transmission (such as a "pdf" file) or through a County approved electronic signature service will be valid and effective as delivery of a manually executed counterpart of this Contract.

14.13 Entire Contract

This Contract for the Work, comprised of the Contract Documents enumerated herein, constitutes the entire Contract between the Parties relating to the subject matter hereof and supersedes all prior or contemporaneous Contracts, negotiations, discussions and understandings, oral or written. This Contract may not be amended or modified except in writing, as provided herein and signed by authorized representatives of both parties.

14.14 Survival

The provisions of the Contract Documents which by their nature survive termination of the Contract, including without limitation all warranties, indemnities, insurance, payment obligations, and the County's right to audit Contractor's books and records, shall in all cases survive the expiration or earlier termination of this Contract.

14.15 Employment Eligibility and Mandatory Use of E-Verify

As a condition precedent to entering into this Contract, and in accordance with section 448.095, F.S., Contractor and its subcontractors shall register with and use the E-Verify system to verify the work authorization status of all employees hired on or after July 1, 2023.

a. Contractor shall require each of its subcontractors to provide Contractor with an affidavit stating that the subcontractor does not employ, contract with, or subcontract with an unauthorized alien. Contractor shall maintain a copy of such affidavit for the duration of this Contract.

b. The County, Contractor, or any subcontractor who has a good faith belief that a person or entity with which it is contracting has knowingly violated section 448.09(1), F.S. or these provisions regarding employment eligibility shall terminate the contract with the person or entity.

c. The County, upon good faith belief that a subcontractor knowingly violated these provisions regarding employment eligibility, but Contractor otherwise complied, shall promptly notify Contractor and Contractor shall immediately terminate the contract with the subcontractor.

d. The Contractor acknowledges that, in the event that the County terminates this Contract for Contractor's breach of these provisions regarding employment eligibility, then Contractor may not be awarded a public contract for at least one (1) year after such termination. Contractor further acknowledges that Contractor is liable for any additional costs incurred by the County as a result of the County's termination of this Contract for breach of these provisions regarding employment eligibility.

14.16 Equal Employment Opportunity

During the performance of this Contract, Contractor agrees as follows:

14.16.1 Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, disability, age, sex (including sexual orientation and gender identity/expression), national origin (including limited English proficiency), marital status, or familial status. Contractor will take affirmative action to ensure that applicants and employees are treated during employment without regard to their race, color, religion, disability, sex, age, national origin, ancestry, marital status, sexual orientation, gender identity or expression, familial status, genetic information or political affiliation. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertisement, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship. Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this non-discrimination clause.

14.16.2 Contractor will, in all solicitations or advertisements for employees placed for, by, or on behalf of Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, disability, sex, age, national origin, ancestry, marital status, sexual orientation, gender identity or expression, familial status, or genetic information.

14.16.3 Contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with Contractor's legal duty to furnish information.

14.16.4 Contractor will send to each labor union or representatives of workers with which it has a collective bargaining Contract or other contract or understanding, a notice to be provided by the County, advising the labor union or workers' representative of Contractor's commitments under Section 202 of Executive Order 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

14.16.5 Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

14.16.6 Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to its books, records, and accounts by the County and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

14.16.7 In the event of Contractor's noncompliance with the nondiscrimination clauses of this Contract or with any of such rules, regulations, or orders, this Contract may be cancelled, terminated or suspended in whole or in part and Contractor may be declared ineligible for further contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

14.16.8 Contractor will include the provisions of paragraphs 14.16.1 through 14.16.7 in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. Contractor will take such action with respect to any subcontractor or vendor as may be directed to the Secretary of Labor as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, that in the event Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction, Contractor may request the United States to enter into such litigation to protect the interest of the United States.

14.17 Public Records

14.17.1 Contractor shall comply and shall require all of its Subcontractors to comply with the State of Florida's Public Records Statute (Chapter 119), specifically to:

(1) Keep and maintain public records that ordinarily and necessarily would be required by the County in order to perform the Services;

(2) Upon request from the County's custodian of public records, provide the County with a copy of the requested records or allow the records to be inspected or copied within a reasonable time at a cost that does not exceed the cost as provided in Chapter 119, Florida Statutes, or as otherwise provided by Applicable Law;

(3) Ensure that public records related to this Contract that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by Applicable Law for the duration of this Contract and following expiration of this Contract, or earlier termination thereof, if Contractor does not transfer the records to the County; and

(4) Upon completion of this Contract, or earlier termination thereof, transfer, at no cost, to the County all public records in possession of Contractor or keep and maintain for inspection and copying all public records required by the County to perform the Work.

14.17.2 If Contractor, upon expiration of this Contract or earlier termination thereof i) transfers all public records to the County, Contractor shall destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure requirements; and ii) keeps and maintains public records, Contractor shall meet all Applicable Law and requirements for retaining public records. All records stored electronically must be provided to the County, upon request from the County's custodian of public records, in a format that is compatible with the County's information technology systems.

14.17.3 Failure by Contractor to comply with the requirements of this section shall be grounds for immediate, unilateral termination of this Contract by the County.

IF CONTRACTOR HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO ITS DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS CONTRACT, CONTACT THE CUSTODIAN OF PUBLIC RECORDS AT: (904) 209-0805, PUBLICRECORDS@SJCFL.US, 500 SAN SEBASTIAN VIEW, ST. AUGUSTINE, FLORIDA 32084

14.18 Anti-Bribery

Contractor and its Subcontractors shall at all times during the term of this Contract comply with all anti-bribery and corruption laws that are applicable to the performance of this Contract. Contractor represents that it has not, directly or indirectly, taken any action which would cause it to be in violation of Chapter 838 of the Florida Statutes. Contractor shall immediately notify the County of any violation (or alleged violation) of this provision.

14.19 Convicted and Discriminatory Vendor Lists, and Scrutinized Companies

14.19.1 Contractor warrants that neither it nor any Subcontractor is currently on the convicted vendor list or the discriminatory vendor list maintained pursuant to Sections 287.133 and 287.134 of the Florida Statutes, or on any similar list maintained by any other state or the federal government. Contractor shall immediately notify the County in writing if its ability to perform is compromised in any manner during the term of the Contract.

14.19.2 Section 287.135 of the Florida Statutes prohibits agencies from contracting with companies for goods or services that are on the Scrutinized Companies that Boycott Israel List, or with companies that are engaged in a boycott of Israel, and from contracting with companies for goods or services of $1,000,000 or more that are on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, or are engaged in business operations in Cuba or Syria. The lists are created pursuant to §215.473 and §215.4725, F.S. By execution of this Contract, Contractor certifies that it is not listed on the Scrutinized Companies that Boycott Israel List, the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, and is not engaged in a boycott of Israel or engaged in business operations in Cuba or Syria, and understands that pursuant to §287.135, F.S., the submission of a false certification may subject Contractor to civil penalties, attorney's fees, and/or costs. In accordance with §287.135, F.S., the County may terminate this Contract if a false certification has been made, or the Contractor is subsequently placed on any of these lists, or engages in a boycott of Israel or is engaged in business operations in Cuba or Syria.

14.20 Compliance with Florida Statute 287.138

14.20.1 Pursuant to 287.138 F.S., effective July 1, 2023, the County may not enter into contracts which grants the Contractor access to personal identifiable information if: 1) the Contractor is owned by the government of a Foreign Country of Concern (as defined by the statute: (b) the government of a Foreign Country of Concern has a controlling interest in the entity; or (c) the Contractor is organized under the law of or has its principal place of business in a Foreign Country of Concern. The County shall be entitled to immediately terminate this Agreement with liability to ensure the County's continued compliance with the statute.

14.20.2 Pursuant to 287.138 F.S., effective January 1, 2024, if Contractor may access, receive, transmit, or maintain personal identifiable information under this Agreement, Contractor must submit a Foreign Entity Affidavit to the County. Additionally, effective July 1, 2025, Contractor shall submit a Foreign Entity Affidavit to the County prior to any renewals of this Agreement. Failure or refusal to submit a Foreign Entity Affidavit shall be cause for immediate termination of this Agreement by the County.

14.21 Written Notice

Any and all notices, requests, consents, approvals, demands, determinations, instructions, and other forms of written communication under this Contract shall be validly given when delivered as follows:

i. Hand delivered to Contractor's Authorized Representative or hand delivered during normal business hours and addressed as shown below, or

ii. Delivered by U.S. Mail, electronic mail or commercial express carrier, (postage prepaid, delivery receipt requested), to the following addresses:

St. Johns County
4040 Lewis Speedway
St. Augustine, FL 32084
Attn: Bryan Matus
Email Address: bmatus@sjcfl.us

SGS Contracting Services, Inc.
Address: 256134 W. US HWY 27
High Springs, FL 32643
Attn: Seth Simmons
Email Address: seth@sgscsi.com

With a copy to:

St. Johns County
Office of the County Attorney
500 San Sebastian View
St. Augustine, FL 32084
Email Address: jferguson@sjcfl.us

Notices shall be deemed to have been given on the date of delivery to the location listed above without regard to actual receipt by the named addressee. County and Contractor may each change the above addresses at any time upon prior written notice to the other party.

****

The authorized representatives hereto have executed this Contract effective as of the Effective Date. Contractor's authorized representative executing this Contract represents that he or she is duly authorized to execute this Contract on behalf of Contractor.

County:

St. Johns County (Seal)
(Typed Name)

By: _____
(Signature of Authorized Representative)

_____
(Printed Name)

_____
(Title)

_____
(Date of Execution)

Contractor:

_____ (Seal)
(Typed Name)

By: _____
(Signature of Authorized Representative)

_____
(Printed Name)

_____
(Title)

_____
(Date of Execution)

Legally Sufficient:

_____
(Office of County Attorney)

_____
(Date of Execution)

FORM 1

CERTIFICATION OF PAYMENTS TO SUBCONTRACTORS

Contract No.	
Project Title:	

The undersigned Contractor hereby swears under penalty of perjury that:

1. Contractor has paid all Subcontractors all undisputed contract obligations for labor, services, or materials provided on this Project within the time period set forth in Sections 218.73 and 218.735, Florida Statutes, as applicable.

2. The following Subcontractors have not been paid because of disputed contractual obligations; a copy of the notification sent to each, explaining the good cause why payment has not been made, is attached to this form:

Subcontractor Name and Address	Date of Disputed Invoice	Amount in Dispute

Contractor's Authorized Representative executing this Certification of Payments to Subcontractors represents that he or she is duly authorized to execute this Certificate, or if executing on behalf of another, is authorized to do so and that such Authorized Representative is legally bound.

Dated _____, 20__

Contractor _____

By: _____
(Signature)

By: _____
(Name and Title)

STATE OF _____)
) SS.
COUNTY OF _____)

The foregoing instrument was acknowledged before me, by means of ☐ physical presence or ☐ online notarization, this _____ day of _____, 20__, by _____, who is personally known to me or who has produced _____as identification and who did (did not) take an oath.

NOTARY PUBLIC:

Signature: _____

Print Name: _____

(NOTARY SEAL)
My commission expires:

FORM 2

CONTRACTOR'S FINAL RELEASE AND WAIVER OF LIEN

Owner: St. Johns County (hereafter "County")	**County Department/Division:**
Contract No.:	**Contractor Name:**
Project:	**Contractor Address:**
Project Address:	**Contractor License No.:**
Payment Amount:	**Amount of Disputed Claims:**

The undersigned has been paid in full for all labor, work, services, materials, equipment, and/or supplies furnished to the Project or to the County and does hereby waive and release any notice of lien, any right to mechanic's lien, any bond right, any claim for payment and any rights under any similar ordinance, rule or statute related to a claim or payment rights the undersigned has on the above described Project, except for the payment of Disputed Claims, if any, described below.

The undersigned warrants that he or she either has already paid or will use the monies received from this final payment to promptly pay in full all of its laborers, subcontractors, materialmen and suppliers for all labor, work, services, materials, equipment, or supplies provided for or to the above referenced Project.

Before any recipient of this document relies on it, the recipient should verify evidence of payment to the undersigned.

Disputed Claims: The following invoices, pay applications, retention, or extra work are reserved by undersigned from this final payment (if there are no Disputed Claims enter **"None"**):

None

Signed this __day of _____, 20__

_____
Contractor/Company Name

By: _____
Signature

_____
Printed Name

_____
Title

NOTICE: THIS DOCUMENT WAIVES RIGHTS UNCONDITIONALLY AND STATES THAT YOU HAVE BEEN PAID FOR GIVING UP THOSE RIGHTS. THIS DOCUMENT IS ENFORCEABLE AGAINST YOU IF YOU SIGN IT TO THE EXTENT OF THE PAYMENT AMOUNT OR THE AMOUNT RECEIVED.

NOTICE OF INTENT TO AWARD

August 21, 2026

IFB No: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

St. Johns County hereby issues this Notice of Intent to Award to SGS Contracting Services, Inc. as the lowest, responsive, responsible Bidder under the above referenced Invitation for Bids.

Any actual Bidder, Proposer or Supplier who is aggrieved in connection with the Notice of Intent to Award a Contract, where such grievance is asserted to be the result of a violation of the requirements of the St. Johns County Purchasing Policy and associated procedures, or any applicable provision of law by the officers, agents, or employees of the County, may file a Protest to the Director of Purchasing & Contracts. The Protest must be made in writing and filed by 4:00PM on the fifth business day following the date of the posting of the Notice of Intent to Award, and must be submitted in accordance with Section 13, SJC Purchasing Policy.

Should no Protest be received in response to this Notice the County will proceed with award of a Contract in accordance with SJC Purchasing Policy.

Please forward all correspondence, requests or inquiries directly to Richard E. Poulin Jr., Procurement Coordinator, via email at rpoulin@sjcfl.us or phone at (904) 209-0160.

St. Johns County, FL
Board of County Commissioners
Purchasing Department

Date: 8/21/26

Bryan Matus, CPPO, FCCM
Purchasing Manager
bmatus@sjcfl.us
(904) 209-0148 - Direct

ST. JOHNS COUNTY, FL
BID TABULATION

OPENING DATE: 8/19/2026
OPENED BY: Richard E. Poulin Jr. RP
VERIFIED BY: Kayla Lauro KL
POSTING DATE:

IFB NUMBER: 2995; North Beach Water Treatment Plant Improvements

Bidders	Lump Sum Base Bid Price	Allowance #01 FPL Involvement	Allowance #02 AT&T Involvement	Alternate #01 Total Lump Sum Bid	Lump Sum Base Bid Price + Alternate #01	
Petticoat-Schmitt Civil Contractors, Inc.	$5,921,843.60	$10,000.00	$20,000.00	$1,822,667.40	$7,744,511.00	
ACON Construction Co., Inc.	$6,600,000.00	$10,000.00	$20,000.00	$2,060,000.00	$8,660,000.00	
Sawcross, Inc.	$5,626,000.00	$10,000.00	$20,000.00	$1,885,000.00	$7,511,000.00	
SGS Contracting Services, Inc.	$5,296,700.00	$10,000.00	$20,000.00	$1,649,700.00	$6,946,400.00	
L7 Construction, Inc.	$5,238,700.00	$10,000.00	$20,000.00	$2,380,000.00	$7,618,700.00	

Any actual Bidder who is aggrieved in connection with the Notice of Intent to Award, where such grievance is asserted to be the result of a violation of the requirements of the County's Purchasing Policy and associated procedures, or any applicable provision of law by the officers, agents, or employees of the County, may file a Protest with the Purchasing Director. The Protest must be submitted in writing, accompanied by a security in the form of a Protest Bond, by 4:00PM on the fifth business day following the date of the posting of the Notice of Intent to Award.

All public records shall become available for inspection and copying pursuant to Chapter 119, Florida Statutes.

IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

REVISED OFFICIAL COUNTY BID FORM (Addendum #01)
ST. JOHNS COUNTY, FLORIDA

PROJECT: NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

TO: THE BOARD OF COUNTY COMMISSIONERS OF ST. JOHNS COUNTY, FLORIDA

DATE SUBMITTED: 08-19-2026

BID PROPOSAL OF

SGS CONTRACTING SERVICES, INC.
Full Legal Company Name

256134 W US HWY 27, HIGH SPRINGS, FL 32643 386-361-5300 SETH@SGSCSI.COM
Mailing Address Telephone Number Email

Bidders: Having become familiar with requirements of the project, and having carefully examined the IFB Documents and Specifications entitled for **IFB No: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS** in St. Johns County, Florida, the undersigned proposes to furnish all materials, labor and equipment, supervision and all other requirements necessary to comply with the Contract Documents to submit the following Bid Proposal summarized as follows:

LUMP SUM BASE BID PRICE: All cost for all labor, materials, equipment, supplies, taxes, other miscellaneous costs, profit, and overhead, both direct and indirect, for completion of all Work except for those Bid Items herein listed separately.

$ 5,296,700.00
Lump Sum Base Bid Price (Written in Numerals)

$ Five Million Two Hundred Ninty Six Thousand Seven Hundred NO/100 /Dollars
Lump Sum Base Bid (Written in Words)

Allowance #01: Florida Power and Light Involvement **$10,000.00**
Allowance #02: AT&T Involvement **$20,000.00**

TOTAL BID PRICE: Total amount calculated by adding the Lump Sum Base Bid, Allowance 1, and Allowance 2 amounts together to determine the Total Bid Price for completion of this Project.

$ 5,326,700.00
Total Bid Price (Written in Numerals)

$ Five Million Three Hundred Twenty Six Thousand Seven Hundred NO/100 /Dollars
Total Bid Price (Written in Words)

IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

REVISED OFFICIAL COUNTY BID FORM (Addendum #01)(CONTINUED)
ST. JOHNS COUNTY, FLORIDA

BID ALTERNATE #01 TOTAL LUMP SUM BID: All costs for all labor, materials, equipment, supplies, taxes, other miscellaneous costs, profit, and overhead, both direct and indirect, for completion of the following work identified in Exhibit A:

1. New degasifier (aeration) system and blower, equipment pad, associated valves and piping.
2. Pumps from new aeration system to existing GST's.
3. Odor control system and associated valves and piping.
4. Demolition of the existing aeration system and clear well.

$ 1,649,700.00
Bid Alternate #01 Total Lump Sum Bid (Written in Numerals)

$ One Million Six Hundred Forty Nine Thousand Seven Hundred 00/100
Bid Alternate #01 Total Lump Sum Bid (Written in Words)

Bidder shall insert the Bid Alternate(s) Price above, in numerals and in words. Failure to provide Bid Alternate pricing for consideration shall deem the Bid unresponsive.

IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

CORPORATE/COMPANY

Full Legal Company Name: SGS CONTRACTING SERVICES, INC. (Seal)

By: SETH SIMMONS — SETH SIMMONS - PRESIDENT
Signature of Authorized Representative (Name & Title typed or printed)

By: N/A — N/A
Signature of Authorized Representative (Name & Title typed or printed)

Address: 25613 W US HWY 27, HIGH SPRING, FL 32643

Telephone No.: (___) 386-361-5300 Fax No.: (___)

Email Address for Authorized Company Representative: SETH@SGSCSI.COM

Federal I.D. Tax Number: 46-1147891 DUNS #: 078852922
(If applicable)

~~**INDIVIDUAL**~~

~~Name: _____~~
~~(Signature) (Name typed or printed) (Title)~~

~~Address: _____~~

~~Telephone No.: (___) _____ Fax No.: _____~~

~~Email Address: _____~~

~~Federal I.D. Tax Number: _____~~

Point of Contact (POC) to receive invitation from PaymentWorks for registration to set up a PaymentWorks account OR Point of Contact (POC) who is currently connected to Company's existing PaymentWorks account:

Authorized POC: MICHELLE MONTGOMERY Email Address for POC: MICHELLE@SGSCSI.COM
(Name typed or printed)

Each Bidder must submit all required forms and attachments. Failure to submit any required document may be grounds for disqualification due to non-responsiveness.

Submittal Requirements: Official County Bid Form, and all Attachments must be completed and submitted with each copy of the Bid Proposal.

IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

ATTACHMENT "A"
ST. JOHNS COUNTY AFFIDAVIT

Bidder shall complete and submit a sworn statement as part of the submitted Bid. This sworn statement shall be an Affidavit in the following form, executed by an officer/principal of the Bidder, and shall be sworn to before a person who is authorized by law to administer oaths.

STATE OF FL

COUNTY OF ALACHUA

The Undersigned authority, SETH SIMMONS ("Affiant"), who being duly sworn, deposes and states that he/she is the PRESIDENT (Title) of the Bidder SGS CONTRACTING SERVICES, INC. (Full Legal Name of Bidder) submitting the attached Bid for the services provided in the IFB Documents for **IFB No: 2995; North Beach Water Treatment Plant Improvements**, in St. Johns County, Florida.

The Affiant further states that no more than one Bid for the above-referenced project will be submitted from the Bidder, the Affiant, their firm or corporation under the same or different name, and that such Bidder has no financial interest in the firm of another Bidder for the same work. Affiant also states that neither he/she, the firm, association nor corporation of the Bidder has either directly or indirectly entered into any agreement, participated in any collusion, nor otherwise taken any action in restraint of free competitive bidding in connection with this firm's Bid on the above-described project. Furthermore, neither the firm nor any of its officers are barred from participating in public contract lettings in the State of Florida or any other state.

DATED this 19TH day of AUGUST, 2026.

Signature of Affiant

SETH SIMMONS
Printed Name of Affiant

PRESIDENT
Printed Title of Affiant

SGS CONTRACTING SERVICES, INC.
Full Legal Name of Consultant/Contractor

Sworn to (or affirmed) and subscribed before me by means of ☒ physical presence or ☐ online notarization, this 19TH day of AUGUST, 2026, by Affiant, who is personally known to me or has produced _____ as identification.

Notary Public
My Commission Expires: 06-28-30

MICHELLE MONTGOMERY
Notary Public - State of Florida
Commission # HH 811032
My Comm. Expires Jun 28, 2030
Bonded through National Notary Assn.

IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

ATTACHMENT "B"
CERTIFICATES AS TO CORPORATE PRINCIPAL

I, WALLIS SIMMONS, certify that I am the Secretary of the corporation named as Principal in the foregoing; that SETH SIMMONS, (Authorized Representative of Bidder) who signed the Bond(s) on behalf of the Bidder, was then PRESIDENT (Title) of said corporation; that I know his/her signature; and his/her signature thereto is genuine; and that said bond(s) was duly signed, sealed, and attested to on behalf of said corporation by authority of its governing body.

Signature of Secretary

SGS CONTRACTING SERVICES, INC.
Full Legal Name of Corporation (Bidder)

STATE OF FL

COUNTY OF ALACHUA

Before and by me, a Notary Public duly commissioned, qualified and acting personally, being duly sworn upon oath by means of ☒ physical presence or ☐ online notarization, SETH SIMMONS (Authorized Representative of Bidder) states that he/she is authorized to execute the foregoing Bid Bond on behalf of the Bidder named therein in favor of St. Johns County, Florida.

Subscribed and sworn to me on this 19TH day of AUGUST, 2026 by the Authorized Representative of Bidder, who is personally known to me or has produced _____ as identification. Type and Number of I.D. produced: _____.

MICHELLE MONTGOMERY
Notary Public - State of Florida
Commission # HH 811032
My Comm. Expires Jun 28, 2030
Bonded through National Notary Assn.

Notary Public
My Commission Expires: 6-28-30

(Attach Power of Attorney to original Bid Bond and Financial Statement of Surety Company)

IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

ATTACHMENT "C"
LICENSE / CERTIFICATION LIST

In the space below, the Bidder shall list all **current** licenses and certifications held.

The bidder shall attach a copy of each current license, certifications listed below to this form.

The bidder must also attach a list of any and all relevant experience within the last five (5) years with the proposed scope of work.

License(s)/Certificate(s)/ Pre-Qualifications	License #	Issuing Agency	Expiration Date
State of Florida Business License	P12000085304	State of FL	12-31-26
SJC Local Business Tax Receipt or Local Jurisdiction in the State of Florida where the Bidder's permanent business location.	0061	City of High Springs	09-30-26
FL Certified General Contractor (CGC)	CGC1514772	STATE OF FL	08-31-2028
~~**FL Certified Building Manufacturer (MB)**~~		N/A - ADDENDUM 3	
~~**FL Certified Erector (ME)**~~		N/A - ADDENDUM 3	

IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

ATTACHMENT "D"
LIST OF PROPOSED SUB-CONTRACTORS / SUPPLIERS

Bidder shall submit any and all sub-contractors and/or major material suppliers proposed to perform any portion of the Work for review/approval by the County. Bidder shall attach any and all applicable licenses or certifications held by the proposed sub-contractor/supplier related to the portion of the Work for which they are proposed, as stated below. All subcontractors/suppliers are subject to the approval of the County.

Company Name	Work/Services to be Performed	Primary Contact Name	Contact Number and Email Address
Heckman Electric	Electrical	Shawn Heckman	352-443-2255
Modern Steel	Metal Building	David McNutt	229-554-3060
Fluence	RO Systems	Scott Griffith	404-964-3297
Walker	Concrete	Eric Walker	407-925-1262
C2i	Controls	Mark Healy	678-576-7223
Tencarva	Pumps	Matt Davis	904-733-8144

IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

ATTACHMENT "E"
CONFLICT OF INTEREST DISCLOSURE FORM

Project (IFB) Number/Description: **IFB No 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS**

The term "conflict of interest" refers to situations in which financial or other considerations may adversely affect, or have the appearance of adversely affecting a Contractor's professional judgment in completing work for the benefit of St. Johns County ("County"). The bias such conflicts could conceivably impart may inappropriately affect the goals, processes, methods of analysis or outcomes desired by the County.

Contractors are expected to safeguard their ability to make objective, fair, and impartial decisions when performing work for the benefit of the County. Contractors, therefore must there avoid situations in which financial or other considerations may adversely affect, or have the appearance of adversely affecting the Contractor's professional judgement when completing work for the benefit of the County.

The mere appearance of a conflict may be as serious and potentially damaging as an actual distortion of goals, processes, methods of analysis or outcomes. Reports of conflicts based upon appearances can undermine public trust in ways that may not be adequately restored even when the mitigating facts of a situation are brought to light. Apparent conflicts, therefore, should be disclosed and evaluated with the same vigor as actual conflicts.

It is expressly understood that failure to disclose conflicts of interest as described herein may result in immediate disqualification from evaluation or immediate termination from work for the County.

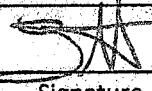
Please check the appropriate statement:

☒ I hereby attest that the undersigned Bidder has no actual or potential conflict of interest due to any other clients, contracts, or property interests for completing work on the above referenced project.

☐ The undersigned Bidder, by attachment to this form, submits information which may be a potential conflict of interest due to other clients, contracts or property interests for completing work on the above referenced project.

Full Legal Name of Bidder: SGS CONTRACTING SERVICES, INC.

Authorized Representative(s):

	SETH SIMMONS - PRESIDENT
Signature	Print Name/Title
N/A	N/A
Signature	Print Name/Title

IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

ATTACHMENT "F"
DRUG-FREE WORKPLACE FORM

The undersigned firm, in accordance with Florida Statute 287.087 hereby certifies that

SGS CONTRACTING SERVICES, INC. does:
Full Legal Name of Bidder

1. Publish a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession or use of a controlled substance is prohibited in the workplace and specifying the actions that will be taken against employees for violations of such prohibition.

2. Inform employees about the danger of drug abuse in the workplace, the business' policy of maintaining a drug-free workplace, any available drug counseling, rehabilitation, employee assistance programs and the penalties that may be imposed upon employees for drug abuse violations.

3. Give each employee engaged in providing the contractual services that are described in St. Johns County's request for proposals a copy of the statement specified in paragraph 1.

4. In the statement specified in paragraph 1, notify the employees that, as a condition of working on the contractual services described in paragraph 3, the employee will abide by the terms of the statement and will notify the employer of any conviction of, or plea of guilty or nolo contendere to, any violation of Florida Statute 893, as amended, or of any controlled substance law of the United States or any state, for a violation occurring in the workplace no later than five (5) days after such conviction or plea.

5. Impose a sanction on, or require the satisfactory participation in a drug abuse assistance or rehabilitation program if such is available in the employee's community by, any employee who is so convicted.

6. Consistent with applicable provisions with State or Federal law, rule, or regulation, make a good faith effort to continue to maintain a drug-free workplace through implementation of paragraphs 1 through 5.

As the person authorized to sign this statement, I certify that this firm complies fully with the above requirements.

Signature of Bidder's Authorized Representative

08-19-2026
Date

IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

ATTACHMENT "G"
CLAIMS, LIENS, LITIGATION HISTORY

Bidders must complete all questions below and provide information requested as applicable. Failure to appropriately complete the questions below or provide requested information may be grounds for disqualification. Any material misrepresentation of information may also be grounds for disqualification.

1. Within the past 7 years, has your organization filed suit or a formal claim against a project owner (as a prime or subcontractor) or been sued by or had a formal claim filed by an owner, subcontractor or supplier resulting from a contract dispute? Yes ___ No X If yes, please attach additional sheet(s) to include:
   Description of every action Captions of the Litigation or Arbitration

   Amount at issue: N/A Name (s) of the attorneys representing all parties:

   Amount actually recovered, if any: N/A

   Name(s) of the contract owner(s)/manager(s) to include address and phone number: N/A

2. List all pending litigation and or arbitration. NONE

3. List and explain all litigation and arbitration within the past seven (7) years - pending, resolved, dismissed, etc.
   NONE

4. Within the past 7 years, please list all Liens, including Federal, State and Local, which have been filed against your Company. List in detail the type of Lien, date, amount and current status of each Lien. NONE

5. Have you ever abandoned a contract, been terminated, or had an agency submit a claim on a performance/surety bond to take over a contract?

   Yes X No _____ If yes, please explain in detail: TERMINATED, SEE ATTACHED RE: PASCO COUNTY

6. For all claims filed against your company within the past five (5) years, have all been resolved satisfactorily with final judgment in favor of your company within 90 days of the date the judgment became final? Yes ____ No____
If no, please explain why?
N/A - NO CLAIMS

7. List the status of all pending claims currently filed against your company: N/A - NONE

Liquidated Damages

1. Has an Agency ever withheld retainage, issued liquidated damages or made a claim against any Performance and Payment Bonds? Yes _____ No ____X____ If yes, please explain in detail:

(Use additional or supplemental pages as needed)

SGS Contracting Services, Inc.

Office: PO Box 908 – High Springs, FL 32655
Phone: (386) 361-5300
CGC 1514772 / CUC 1225090

STATEMENT REGARDING PAST CONTRACT TERMINATION

We at SGS Contracting Services, Inc. pride ourselves in the successful completion of all projects, including those in which adversity is encountered. However, we acknowledge that the Project Owner may at any time, due to no fault of the Contractor, determine that cancellation of the contract for convenience is in their best interest. The information presented below is descriptive of any such events experienced by our firm.

PROJECT: Cow Path Master Pump Station (Pasco County, FL)
DATE(S): September 2019 (terminated for convenience)

DESCRIPTION:
While excavating at an approximate depth of 25' BLS for the construction of a designed cast-in-place wet-well bottom slab, we encountered a confined artesian aquifer condition, which was unexpected by all parties. Subsequent geotechnical investigations confirmed the condition, and the EOR determined that alternate designs and construction methods would likely be required. As a result, the County elected to terminate our contract for convenience and complete the project at a later date. Due to the nature of the issue, there were no bond claims or implications, nor were any legal measures required. All matters pertaining to the termination were amicable between our firm and Pasco County.

IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

ATTACHMENT "H"

SWORN STATEMENT UNDER SECTION 287.133(3)(A), FLORIDA STATUTES ON PUBLIC ENTITY CRIMES

I, SETH SIMMONS ("Affiant"), being duly authorized by and on behalf of SGS CONTRACTING SERVICES, INC ("Bidder") hereby swears or affirms as follows:

1. The principal business address of Bidder is: 25613 W US HWY 27, HIGH SPRINGS, FL 32643

2. I am duly authorized as PRESIDENT (Title) of Bidder.

3. I understand that a public entity crime as defined in Section 287.133 of the Florida Statutes includes a violation of any state or federal law by a person with respect to and directly related to the transaction of business with any public entity in Florida or with an agency or political subdivision of any other state or with the United States, including, but not limited to, any bid, proposal, reply, or contract for goods or services, any lease for real property, or any contract for the construction or repair of a public building or public work, involving antitrust, fraud, theft, bribery, collusion, racketeering, conspiracy, or material misrepresentation.

4. I understand that "convicted" or "conviction" is defined in Section 287.133 of the Florida Statutes to mean a finding of guilt or a conviction of a public entity crime, with or without an adjudication of guilt, in any federal or state trial court of record relating to charges brought by indictment or information after July 1, 1989, as a result of a jury verdict, non-jury trial, or entry of a plea of guilt or nolo contendere.

5. I understand that "affiliate" is defined in Section 287.133 of the Florida Statutes to mean (1) a predecessor or successor of a person or a corporation convicted of a public entity crime, or (2) an entity under the control of any natural person who is active in the management of the entity and who has been convicted of a public entity crime, or (3) those officers, directors, executives, partners, shareholders, employees, members, and agents who are active in the management of an affiliate, or (4) a person or corporation who knowingly enters into a joint venture with a person who has been convicted of a public entity crime in Florida during the preceding 36 months.

6. Neither the Bidder, nor any officer, director, executive, partner, shareholder, employee, member or agent who is active in the management of the Offeror or contractor, nor any affiliate of the Offeror or contractor has been convicted of a public entity crime subsequent to July 1, 1989. **(Draw a line through paragraph 6 if paragraph 7 below applies.)**

7. ~~There has~~ been a conviction of a public entity crime by the Respondent, or an officer, director, ~~executive, partner,~~ shareholder, ~~employee, member~~ or agent of the Bidder who is active in the ~~management of the Bidder~~ or an affiliate of the Bidder. A determination has been made ~~pursuant to Section 287.133(3) by~~ order of the Division of Administrative Hearings that it is not in the public interest for ~~the name of the convicted person or affiliate~~ to appear on the convicted vendor list. The name of the ~~convicted~~ person or affiliate is _____. ~~A copy of the order of the Division of Administrative Hearings~~ is attached to this statement. **~~(Draw a line through paragraph 7 if paragraph 6 above applies.)~~**

Signature of Affiant

SETH SIMMONS - PRESIDENT
Printed Name & Title of Affiant

SGS CONTRACTING SERVICES, INC.
Full Legal Name of Bidder

08-19-2026
Date of Signature

Sworn to (or affirmed) and subscribed before me by means of ☒ physical presence or ☐ online notarization, this 19TH day of AUGUST, 2026 by Affiant, who is ☒ personally known to me or ☐ has produced _____ as identification.

Notary Public

08-28-30
My Commission Expires

MICHELLE MONTGOMERY
Notary Public - State of Florida
Commission # HH 811032
My Comm. Expires Jun 28, 2030
Bonded through National Notary Assn.

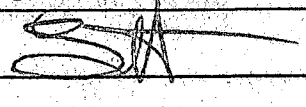
ATTACHMENT "I"
NON-COLLUSION CERTIFICATION

St. Johns County requires, as a matter of policy, that any Firm receiving a contract or award resulting from the Invitation for Bid issued by St. Johns County shall make certification as below. Receipt of such certification, under oath, shall be a prerequisite to the award of contract and payment thereof.

I (we) hereby certify that if the contract is awarded to me, our firm, partnership or corporation, that no members of the elected governing body of St. Johns County nor any professional management, administrative official or employee of the County, nor members of his or her immediate family including spouse, parents or children, nor any person representing or purporting to represent any member or members of the elected governing body or other official, has solicited, has received or has been promised, directly or indirectly, any financial benefit including but not limited to a fee, commission, finder's fee, political contribution, goods or services in return for favorable review of any Bids submitted in response to the Invitation for Bid or in return for execution of a contract for performance or provision of services for which Bids are herein sought.

Handwritten Signature of Authorized Principal(s) of Bidder:

NAME (print): SETH SIMMONS

SIGNATURE: 

TITLE: PRESIDENT

DATE: 08-19-2026

FULL LEGAL NAME OF PROVIDER:

SGS CONTRACTING SERVICES, INC.

ATTACHMENT "J"
E-VERIFY AFFIDAVIT

STATE OF FL
COUNTY OF ALACHUA

I, SETH SIMMONS (hereinafter "Affiant"), being duly authorized by and on behalf of SGS CONTRACTING SERVICES, INC. (hereinafter "Contractor") hereby swears or affirms as follows:

1. Contractor understands that E-Verify, authorized by Illegal Immigration Reform and Immigrant Responsibility Act of 1996 (IIRIRA), is a web-based system provided by the United States Department of Homeland Security, through which employers electronically confirm the employment eligibility of their employees.

2. For the duration of Contract No. TBD (hereinafter "Agreement"), in accordance with section 448.095, F.S., Contractor shall utilize the U.S. Department of Homeland Security's E-Verify system to verify the employment eligibility of all new employees hired by the Contractor and shall expressly require any subcontractors performing work or providing services pursuant to the Agreement to likewise utilize the U.S. Department of Homeland Security's E-Verify system to verify the employment eligibility of all new employees hired by the subcontractor.

3. Contractor shall comply with all applicable provisions of section 448.095, F.S., and will incorporate in all subcontracts the obligation to comply with section 448.095, F.S.

4. Contractor understands and agrees that its failure to comply with all applicable provisions of section 448.095, F.S. or its failure to ensure that all employees and subcontractors performing work under the Agreement are legally authorized to work in the United States and the State of Florida constitute a breach of the Agreement for which St. Johns County may immediately terminate the Agreement without notice and without penalty. The Contractor further understands and agrees that in the event of such termination, Contractor shall be liable to the St. Johns County for any costs incurred by the St. Johns County resulting from Contractor's breach.

DATED this 19 day of AUGUST, 2026.

Signature of Affiant

SETH SIMMONS
Printed Name of Affiant

PRESIDENT
Printed Title of Affiant

SGS CONTRACTING SERVICES, INC.
Full Legal Name of Consultant/Contractor

Sworn to (or affirmed) and subscribed before me by means of ☒ physical presence or ☐ online notarization, this 19TH day of AUGUST, 2026, by Affiant, who is personally known to me or has produced _____ as identification.

MICHELLE MONTGOMERY
Notary Public - State of Florida
Commission # HH 811032
My Comm. Expires Jun 28, 2030
Bonded through National Notary Assn.

Notary Public
My Commission Expires: 06-28-30

ATTACHMENT "K"
EQUAL OPPORTUNITY REPORT STATEMENT

The Bidder shall complete the following statement by signing this form where indicated. Failure to complete this form may be grounds for rejection of bid:

The awarded Contractor shall comply with Title VI of the Civil Rights Act of 1964, the Civil Rights Restoration Act of 1987 and the Florida Civil Rights Act of 1992, as amended) prohibiting employment discrimination and shall comply with the regulations and guidelines promulgated pursuant to this Act by the Secretary of the Interior and the Heritage Conservation and Recreation Service.

During the performance of this contract, the awarded Contractor, for itself, its assignees and successors in interest (hereinafter referred to as the "Contractor") agrees as follows:

(1) The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

(2) The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive considerations for employment without regard to race, color, religion, sex, or national origin.

(3) The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the Contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(5) The Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary

of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

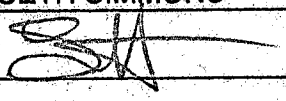
(6) In the event of the Contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions as may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(7) The Contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each sub-Contractor or vendor. The Contractor will take such

action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: Provided, however, That in the event a Contractor becomes involved in, or is threatened with, litigation with a sub-Contractor or vendor as a result of such direction by the administering agency the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

Handwritten Signature of Authorized Principal(s) of Bidder:

NAME (print): SETH SIMMONS

SIGNATURE: 

TITLE: PRESIDENT

FULL LEGAL NAME OF BIDDER: SGS CONTRACTING SERVICES, INC.

DATE: 08-19-2026

IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

ATTACHMENT "L"

Affidavit Regarding the Use of Coercion for Labor and Services

Section 787.06(13), Florida Statutes requires all nongovernmental entities executing, renewing, or extending a contract with a governmental entity to provide an affidavit signed by an officer or representative of the nongovernmental entity under penalty of perjury that the nongovernmental entity does not use coercion for labor or services as defined in that statute.

As an officer or authorized representative of Bidder, I certify that the company identified below does not, for labor or services:

- Use or threaten to use physical force against any person;
- Restrain, isolate, or confine or threaten to restrain, isolate, or confine any person without lawful authority and against her or his will;
- Use lending or other credit methods to establish a debt by any person when labor or services are pledged as a security for the debt, if the value of the labor or services as reasonably assessed is not applied toward the liquidation of the debt, the length and nature of the labor or services are not respectively limited and defined;
- Destroy, conceal, remove, confiscate, withhold, or possess any actual or purported passport, visa, or other immigration document, or any other actual or purported government identification document, of any person;
- Cause or threaten to cause financial harm to any person;
- Entice or lure any person by fraud or deceit; or
- Provide a controlled substance as outlined in Schedule I or Schedule II of s. 893.03 to any person for the purpose of exploitation of that person.

Under penalties of perjury, I declare and affirm that I have read the foregoing document and that the facts stated in it are true and correct.

DATED this 19 day of AUGUST, 2026.

Signature of Affiant

SETH SIMMONS
Printed Name of Affiant

PRESIDENT
Printed Title of Affiant

SGS CONTRACTING SERVICES, INC.
Full Legal Name of Bidder

Sworn to (or affirmed) and subscribed before me by means of ☒ physical presence or ☐ online notarization, this 19 day of AUGUST, 2026, by Affiant, who is personally known to me or has produced _____ as identification.

MICHELLE MONTGOMERY
Notary Public - State of Florida
Commission # HH 811032
My Comm. Expires Jun 28, 2030
Bonded through National Notary Assn.

Notary Public
My Commission Expires: 06-28-30

IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

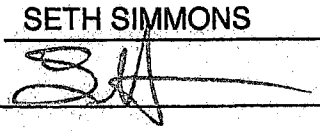
ATTACHMENT "M"
SCRUTINIZED COMPANIES LIST

Section 287.135, Florida Statutes, prohibits agencies from contracting with companies, for products or services over $1,000,000, that are on either the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List. Both lists are created pursuant to section 215.473, Florida Statutes.

As the person authorized to sign on behalf of Bidder, I hereby certify that the company identified below is not listed on either the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List. I understand that pursuant to section 287.135, Florida Statutes, the submission of a false certification may subject the company to civil penalties, attorney's fees, and/or costs.

Handwritten Signature of Authorized Principal(s):

NAME (print): SETH SIMMONS

SIGNATURE: 

TITLE: PRESIDENT

NAME OF FIRM: SGS CONTRACTING SERVICES, INC.

DATE: 08-19-2026

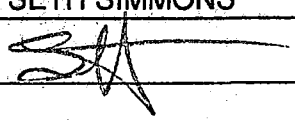
IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

ATTACHMENT "N"
CERTIFICATE OF COMPLIANCE WITH FLORIDA TRENCH SAFETY ACT

Bidder acknowledges that he is solely responsible for complying with the Florida Trench Safety Act (ACT) and Occupational Safety and Health Administrations excavation safety standard 29 CFR 1926.650 (Subpart P as amended) and the St. Johns County Trenching and Excavation Safety Program. If there is a conflict between the ACT and the St. Johns County Trenching and Excavation Safety Program, the more stringent requirement would apply. Bidder further acknowledges that included in the various items of the proposal and in the Total Bid Price are costs for complying with the Florida Trench Safety Act (90-96, Laws of Florida) effective October 1, 1990 and the Occupational Safety and Health Administrations excavation safety standard.

Handwritten Signature of Authorized Principal(s) of Bidder:

NAME (print): SETH SIMMONS

SIGNATURE: 

TITLE: PRESIDENT

DATE: 08-19-2026

NAME OF FIRM/PARTNERSHIP/CORPORATION:

SGS CONTRACTING SERVICES, INC.

ATTACHMENT "O"
ACKNOWLEDGEMENT OF ADDENDA

Bidder hereby acknowledges receipt of the following Addenda, issued by the County and incorporated into and made a part of the IFB Documents. By acknowledging the Addenda listed below, Bidder hereby certifies that the information, clarifications, revisions, or other items included in each Addenda have been incorporated into the Bidder's Bid. Failure to acknowledge and incorporate issued Addenda may result in a Bidder being deemed non-responsive to the requirements of the IFB, and removed from further consideration.

ADDENDUM NUMBER	DATE RECEIVED	PRINT NAME OF BIDDER'S AUTHORIZED REPRESENTATIVE	TITLE OF BIDDER'S AUTHORIZED REPRESENTATIVE	SIGNATURE OF BIDDER'S AUTHORIZED REPRESENTATIVE
1	8/3/26	SETH SIMMONS	PRESIDENT	
2	8/6/26	SETH SIMMONS	PRESIDENT	
3	8/14/26	SETH SIMMONS	PRESIDENT	

SGS CONTRACTING SERVICES, INC.

PROJECT HISTORY

CURRENT PROJECTS (updated 06/01/2026)

Please contact our firm for any contact information not shown herein. Due to turnover, it is difficult to maintain current contact information for many clients

TITLE:	**GAINESVILLE REGIONAL UTILITIES (GRU) GENERAL SERVICE AGREEMENT FOR WATER/WASTEWATER OPERATIONS**		
CONTRACT VALUE:	SCHEDULED COMPLETION:	SERVICE:	
Indefinite Value	N/A	Potable Water	
		Wastewater	
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	
N/A	SGS Contracting Services, Inc.	City of Gainesville (GRU)	
DESCRIPTION:			
General service agreement for repair, rehab and new construction of water resource facilities throughout the utility. Scope of allowable work is unlimited within the facilities.			

TITLE:	**ST. JOHNS COUNTY UTILITY DEPARTMENT SERVICE CONTRACT FOR UTILITY CONTRACTORS**		
CONTRACT VALUE:	SCHEDULED COMPLETION:	SERVICE:	
Indefinite Value	N/A	Potable Water	
		Wastewater	
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	
N/A	SGS Contracting Services, Inc.	St. Johns Co. Utility Dept.	
DESCRIPTION:			
General service agreement for repair, rehab and new construction of water resource facilities throughout the utility. Scope of allowable work is unlimited within the facilities.			

TITLE:	**ORMOND BEACH UTILITY CONTRACTOR SERVICES**		
CONTRACT VALUE:	SCHEDULED COMPLETION:	SERVICE:	
Indefinite Value	N/A	Potable Water	
		Wastewater	
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	
N/A	SGS Contracting Services, Inc.	City of Ormond Beach	
DESCRIPTION:			
General service agreement for repair, rehab and new construction of water resource facilities throughout the utility. Scope of allowable work is unlimited within the facilities.			

TITLE:	**ALACHUA WATER QUALITY & RESILIENCY IMPROVEMENTS**			
CONTRACT VALUE:	SCHEDULED COMPLETION:	SERVICE:		SUPERINTENDENT:
$7,962,700 (original)	June 2026	Water		Joe Gore
$7,962,700 (current)				
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:		PROJECT MANAGER:
Jacobs	SGS Contracting Services, Inc.	City of Alachua		Joby Jett
Larry Gunn		Tom Ridgik		
DESCRIPTION:				
Misc improvements, including new production well, steel contact tank, chemical feed facility, generator, and utility administration Building. Includes heavy site work, electrical and instrumentation improvements.				

TITLE:	**PALATKA RC WILLIS WTP YARD PIPING IMPROVEMENTS**			
CONTRACT VALUE:	SCHEDULED COMPLETION:	SERVICE:		SUPERINTENDENT:
$856,700 (original)	July 2026	Water		Josh Crowson
$856,700 (current)				
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:		PROJECT MANAGER:
Hanson Professional Services	SGS Contracting Services, Inc.	City of Palatka		Lindsey Magura
Daryl Myers				
DESCRIPTION:				
Yard piping improvements to install cross connections between storage tanks for improvement treatment.				

TITLE:	**GRU LIFT STATION 1 IMPROVEMENTS**			
CONTRACT VALUE:	SCHEDULED COMPLETION:	SERVICE:		SUPERINTENDENT:
$4,722,700 (original)	JAugust 2026	Wastewater		John Bradshaw
$4,722,700 (current)				
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:		PROJECT MANAGER:
CDM Smith	SGS Contracting Services, Inc.	City of Gainesville		Joby Jett

					Rachel Lockhart		
DESCRIPTION:							
Replacement of lift station equipment, including pumps, piping, electrical building, generator and controls							
TITLE:	**ORMOND BEACH WRF UV DISINFECTION PROJECT**						
CONTRACT VALUE:		SCHEDULED COMPLETION:			SERVICE:		SUPERINTENDENT:
$6,904,700	(original)	September 2026			Wastewater		Jim Wakley
$6,904,700	(current)						
CONSULTANT:		GENERAL CONTRACTOR:			OWNER:		PROJECT MANAGER:
Mead Hunt		SGS Contracting Services, Inc.			City of Ormond Beach		Joby Jett
DESCRIPTION:							
Construction of UV disinfection facility and misc. modifications to existing chlorine contact structure.							
TITLE:	**ST. JOHNS COUNTY HASTING WTP EXPANSION**						
CONTRACT VALUE:		SCHEDULED COMPLETION:			SERVICE:		SUPERINTENDENT:
$4,576,150	(original)	November 2026			Water		Josh Crowson
$4,576,150	(current)						
CONSULTANT:		GENERAL CONTRACTOR:			OWNER:		PROJECT MANAGER:
Ardurra		SGS Contracting Services, Inc.			St. Johns County		Lindsey Magura
Dave Rasmussen					Kevin Ledbetter		
DESCRIPTION:							
Construction of new reverse osmosis facility and related appurtenances. Includes new building, generator, isntallation of owner-							
furnished equipment, complex piping and controls systems.							
TITLE:	**ST. JOHNS COUNTY MARSH LANDING WRF ELECTRICAL IMPROVEMENTS**						
CONTRACT VALUE:		SCHEDULED COMPLETION:			SERVICE:		SUPERINTENDENT:
$1,841,700	(original)	October 2026			Wastewater		TBD
$1,841,700	(current)						
CONSULTANT:		GENERAL CONTRACTOR:			OWNER:		PROJECT MANAGER:
Carollo		SGS Contracting Services, Inc.			St. Johns County		TJ Jones
					Kevin Ledbetter		
DESCRIPTION:							
Construction of new primary switchgear. Includes new electrical building and replacement of the majority of electrical supply systems							
within the facility.							
TITLE:	**ST. JOHNS COUNTY NEW AERATOR AT PLANTATION WTP**						
CONTRACT VALUE:		SCHEDULED COMPLETION:			SERVICE:		SUPERINTENDENT:
$1,126,700	(original)	June 2026			Water		TBD
$1,126,700	(current)						
CONSULTANT:		GENERAL CONTRACTOR:			OWNER:		PROJECT MANAGER:
Mott MacDonald		SGS Contracting Services, Inc.			St. Johns County		TJ Jones
					Alan Flood		
DESCRIPTION:							
Replacement of existing aerator structure, including the installation of a new aluminum aerator.							
TITLE:	**GRU MURPHREE WTP WELL 9 & 11 IMPROVEMENTS**						
CONTRACT VALUE:		SCHEDULED COMPLETION:			SERVICE:		SUPERINTENDENT:
$2,820,538	(original)	December 2026			Water		Tony Colburn
$2,820,538	(current)						
CONSULTANT:		GENERAL CONTRACTOR:			OWNER:		PROJECT MANAGER:
CDM-Smith		SGS Contracing Services, Inc.			Gainesville Regional Utilities		Seth Simmons
DESCRIPTION:							
Improvements to both well sites, inlcuding demolition of existing backup diesel engines, electrical compoentns, and mechanical systems.							

Includes full replacement of all such systems, including new generators at each site.									
TITLE:	**ST. JOHNS COUNTY BARRIER ISLAND LIFT STATION HARDENING - PACKAGE A**								
CONTRACT VALUE:		SCHEDULED COMPLETION:			SERVICE:		SUPERINTENDENT:		
$1,651,700	(original)	July 2026			Wastewater		TBD		
$1,651,700	(current)								
CONSULTANT:		GENERAL CONTRACTOR:			OWNER:		PROJECT MANAGER:		
Ardurra		SGS Contracing Services, Inc.			St. Johns County (FL)		TJ Jones		
DESCRIPTION:									
Improvements to seven (7) lift stations for the purposes of storm hardening, including improved electrical equipment, emergency backup bypass pumps, and misc. site and piping improvements.									
TITLE:	**SOPCHOPPY WELL 7 IMPROVEMENTS**								
CONTRACT VALUE:		SCHEDULED COMPLETION:			SERVICE:		SUPERINTENDENT:		
$3,571,700	(original)	October 2026			Water		Joe Gore		
$3,571,700	(current)								
CONSULTANT:		GENERAL CONTRACTOR:			OWNER:		PROJECT MANAGER:		
Baskerville-Donovan		SGS Contracing Services, Inc.			City of Sopchoppy		Lindsey Magura		
DESCRIPTION:									
Construction of a new water treatment facility, with new wells, prestressed ground storage tank, high service pump building, full site development, piping and electrical/controls.									
TITLE:	**FORT WHITE PHASE 1 WW TREATMENT SYSTEM - CONTRACT B**								
CONTRACT VALUE:		SCHEDULED COMPLETION:			SERVICE:		SUPERINTENDENT:		
$4,057,700	(original)	December 2026			Wastewater		TBD		
$4,057,700	(current)								
CONSULTANT:		GENERAL CONTRACTOR:			OWNER:		PROJECT MANAGER:		
North FL Professional Assoc.		SGS Contracing Services, Inc.			Town of Fort White		Joby Jett		
DESCRIPTION:									
Construction of new WWTP (concrete packaged plant), operations building, pumping systems, site work and piping.									
TITLE:	**GREENVILLE WWTF EXPANSION**								
CONTRACT VALUE:		SCHEDULED COMPLETION:			SERVICE:		SUPERINTENDENT:		
$3,161,700	(original)	April 2027			Wastewater		TBD		
$3,161,700	(current)								
CONSULTANT:		GENERAL CONTRACTOR:			OWNER:		PROJECT MANAGER:		
Kimley-Horne		SGS Contracing Services, Inc.			City of Greenville (FL)		TBD		
DESCRIPTION:									
Epansion of existing WWTF, to include new BTU and conversion of existing BTU's. Demolition of existing old package plant trains, includes new pumping systems, piping, sitework and electrical. Major equipment pre-purchased by the City.									
TITLE:	**ORLANDO WATER CONSERV I WRF BIOSOLIDS ADDITION OF GRAVITY BELT THICKENER**								
CONTRACT VALUE:		SCHEDULED COMPLETION:			SERVICE:		SUPERINTENDENT:		
$2,976,700	(original)	April 2027			Wastewater		TBD		
$2,976,700	(current)								
CONSULTANT:		GENERAL CONTRACTOR:			OWNER:		PROJECT MANAGER:		
Tetra Tech		SGS Contracing Services, Inc.			City of Orlando (FL)		TBD		
DESCRIPTION:									
Addition of gravity belt thickener (belt press), polymer feed system, sludge feed system, structural demo and major improvements to facility electrical and controls systems.									

SGS CONTRACTING SERVICES, INC.

PROJECT HISTORY

COMPLETED PROJECTS (updated 06/01/2026)

TITLE:	**YANKEETOWN USCG STA RELOCATION - POTABLE WATER TREATMENT SYSTEM**			
CONTRACT VALUE:	COMPLETION:		SERVICE:	SUPERINTENDENT:
$398,895 (original)	May 2026		Water	Joe Boyd
$584,810 (final)				
CONSULTANT:	GENERAL CONTRACTOR:		OWNER:	PROJECT MANAGER:
Robertson Engineering	The Haskell Company		US Dept of Defense	Lindsey Magura
DESCRIPTION:				
Construction of new potable water storage and treatment facility, including GAC filter system, chemical feed, storage tank, and misc. electrical and control components.				

TITLE:	**SJRWMD REDI WWTF PACKAGE PLANT REHAB (CITY OF HAWTHORNE)**			
CONTRACT VALUE:	COMPLETION:		SERVICE:	SUPERINTENDENT:
$998,217 (original)	April 2026		Wastewater	Clifford Hathcox
$998,217 (final)				
CONSULTANT:	GENERAL CONTRACTOR:		OWNER:	PROJECT MANAGER:
Mittauer (CPH)	SGS Contracting Services, Inc.		City of Hawthorne	Lindsey Magura
DESCRIPTION:				
Misc. rehab of exsiting packaged WWTP, including new blowers, aeration, screening, and structural improvements				

TITLE:	**GRU MSWRF CAPACITY & RENEWAL UPGRADE PHASE 1A**			
CONTRACT VALUE:	COMPLETION:		SERVICE:	SUPERINTENDENT:
$15,299,500 (original)	June 2026		Wastewater	Tony Colburn
$16,190,904 (current)				
CONSULTANT:	GENERAL CONTRACTOR:		OWNER:	PROJECT MANAGER:
Jacobs	SGS Contracting Services, Inc.		GRU	Seth Simmons
			Rachel Lockhart	
DESCRIPTION:				
Major expansion to WWTP, including new Master Lift Station, Headworks, Odor Control, Electric Building and major sitework and yard piping throughout.				

TITLE:	**HIGH SPRINGS WWTP EXPANSION & INFILTRATIVE WETLANDS**			
CONTRACT VALUE:	COMPLETION:		SERVICE:	SUPERINTENDENT:
$9,215,000 (original)	January 2026		Wastewater	Clifford Hathcox
$10,533,078 (final, pending)	(pending warranty & misc items June 2026)			
CONSULTANT:	GENERAL CONTRACTOR:		OWNER:	PROJECT MANAGER:
Mittauer	SGS Contracting Services, Inc.		City of High Springs	Lindsey Magura
Tim Norman				
DESCRIPTION:				
Construction of new packaged WWTP, rehab of existing package WWTP, construction of new headworks and chemical feed facilities, Conversion of existing sprayfield to infiltrative wetlands.				

TITLE:	**ST. JOHNS COUNTY SR 16 DIFFUSER REPLACEMENT PROJECT**			
CONTRACT VALUE:	COMPLETION:		SERVICE:	SUPERINTENDENT:
$406,700 (original)	December 2025		Wastewater	John Bradshaw
$406,700 (final)				
CONSULTANT:	GENERAL CONTRACTOR:		OWNER:	PROJECT MANAGER:
N/A	SGS Contracing Services, Inc.		St. Johns County (FL)	TJ Jones
DESCRIPTION:				
Remove and replace existing diffuser system in the aeration basins.				

TITLE:	**SANFORD SWRC BAR SCREEN REPLACEMENT**			
CONTRACT VALUE:	COMPLETION:		SERVICE:	SUPERINTENDENT:
$985,700 (original)	December 2025		Wastewater	Josh Crowson
$985,700 (final)				
CONSULTANT:	GENERAL CONTRACTOR:		OWNER:	PROJECT MANAGER:
N/A	SGS Contracing Services, Inc.		City of Sanford (FL)	TJ Jones
DESCRIPTION:				
Full replacement of existing mechanical bar screens at the facility influent structure, including new electrical, controls, and conveyor.				

TITLE:	**ATLANTIC BEACH WWTP HEADWORKS PIPING REPLACEMENT**			
CONTRACT VALUE:	COMPLETION:		SERVICE:	SUPERINTENDENT:
$746,400 (original)	December 2025		Wastewater	Jim Wakely
$758,463 (final)				
CONSULTANT:	GENERAL CONTRACTOR:		OWNER:	PROJECT MANAGER:
N/A	SGS Contracting Services, Inc.		City of Atlantic Beach	Lindsey Magura
DESCRIPTION:				
Replacement of all screening influent and effluent pipelines at the headworks.				

TITLE:	**ST. JOHNS COUNTY HASTING WTP IMPROVEMENTS**			
CONTRACT VALUE:	COMPLETION:		SERVICE:	SUPERINTENDENT:
$759,700 (original)	May 2025		Water	Clifford Hathcox
$957,203 (final)				
CONSULTANT:	GENERAL CONTRACTOR:		OWNER:	PROJECT MANAGER:
Ardurra	SGS Contracting Services, Inc.		St. Johns County	Lindsey Magura
Dave Rasmussen			Scott Trigg	Seth Simmons

DESCRIPTION:				
Improvements to existing reverse osmosis system, including major electrical upgrades.				
TITLE:	MADISON CRITICAL WATER SYSTEM IMPROVEMENTS - PART A & D			
CONTRACT VALUE:	COMPLETION:		SERVICE:	SUPERINTENDENT:
$3,379,000 (original)	June 2025		Wastewater	Joe Gore
$2,908,261 (final, due to ODP)				
CONSULTANT:	GENERAL CONTRACTOR:		OWNER:	PROJECT MANAGER:
Saltus Engineering	SGS Contracting Services, Inc.		City of Madison	Joby Jett
David Bolam			Mike Lawson	
DESCRIPTION:				
Construction of new public utilities administration building, including associated site development. Misc improvements at three (3) water production facilities, including new electrical, controls, pumps, chemical feed, and buildings.				
TITLE:	CITY OF MADISON WWTP IMPROVEMENTS			
CONTRACT VALUE:	COMPLETION:		SERVICE:	SUPERINTENDENT:
$2,787,700 (original)	June 2025		Wastewater	Tony Colburn
$1,511,278 (final, due to ODP)				
CONSULTANT:	GENERAL CONTRACTOR:		OWNER:	PROJECT MANAGER:
Saltus Engineering	SGS Contracting Services, Inc.		City of Madison	Joby Jett
David Bolam			Mike Lewson	
DESCRIPTION:				
Improvements to several areas of the facility, including dewatering belt press, pump stations, aeration improvements, blowers, grit system, electrical, and controls. Also includes significant building renovations.				
TITLE:	ST JOHNS NW WTP TR 7 WELLHEAD & SITE IMP			
CONTRACT VALUE:	COMPLETION:		SERVICE:	SUPERINTENDENT:
$414,700 (original)	July 2025		Water	Clifford Hathcox
$459,888 (final)				
CONSULTANT:	GENERAL CONTRACTOR:		OWNER:	PROJECT MANAGER:
Constantine	SGS Contracting Services, Inc.		St. Johns County	Seth Simmons
Dave Rasmussen			Dustin Dykes	
DESCRIPTION:				
Installation of new well pump, distribution piping, and misc. site improvements.				
TITLE:	PALATKA PLATT DREW WWTP BIOSOLIDS IMPROVEMENTS			
CONTRACT VALUE:	COMPLETION:		SERVICE:	SUPERINTENDENT:
$4,346,700 (original)	JUNE 2025		Wastewater	Josh Crowson
$4,831,484 (final)				
CONSULTANT:	GENERAL CONTRACTOR:		OWNER:	PROJECT MANAGER:
Hanson Professional Services	SGS Contracting Services, Inc.		City of Palatka	Lindsey Magura
Daryl Myers			Brian McCann	
DESCRIPTION:				
Misc. rehab items, including aeration, blowers, heavy demolition, belt press and conveyor, sludge pumps, polymer feed system, new CMU building, and extensive electrical modifications				
TITLE:	CAMP BLANDING (CBJTC) WWTF SCADA IMPROVEMENTS			
CONTRACT VALUE:	SCHEDULED COMPLETION:		SERVICE:	SUPERINTENDENT:
$2,836,700 (original)	January 2025		Water / Wastewater	Joe Gore
$4,035,256 (final)				
CONSULTANT:	GENERAL CONTRACTOR:		OWNER:	PROJECT MANAGER:
Simes & Rosch	SGS Contracting Services, Inc.		State of FLDOD	Joby Jett
Cliff Simes				
DESCRIPTION:				
SCADA improvements throughout the system, aeration basin equipment rehab, water production facilities rehab, concrete rehab, & misc. piping and treatment equipment improvements throughout the system.				
TITLE:	ORMOND BEACH WRF UPGRADES			
CONTRACT VALUE:	SCHEDULED COMPLETION:		SERVICE:	SUPERINTENDENT:
$1,068,700 (original)	January 2025		Wastewater	TBD
$1,068,700 (current)				
CONSULTANT:	GENERAL CONTRACTOR:		OWNER:	PROJECT MANAGER:
Mead Hunt	SGS Contracting Services, Inc.		City of Ormond Beach	Joby Jett
			Mike Stephenson	
DESCRIPTION:				
Replacement of sludge pumps, centrifuge feed pump, chemical feed improvements, and misc. yard piping.				
TITLE:	ELLISVILLE WWTP EXPANSION			
CONTRACT VALUE:	SCHEDULED COMPLETION:		SERVICE:	SUPERINTENDENT:
$1,047,700 (original)	December 2024		Wastewater	Tony Colburn
$1,306,911 (final)				
CONSULTANT:	GENERAL CONTRACTOR:		OWNER:	PROJECT MANAGER:
Arcadis	SGS Contracting Services, Inc.		Columbia County	Kiel Kruse
Sean Chapparo			Chad Williams	
DESCRIPTION:				
Improvements to several areas of the facility, including dewatering belt press, pump stations, aeration improvements, blowers, grit system, electrical, and controls. Also includes significant building renovations.				
TITLE:	PIERSON WATER SUPPLY & WELLS			
CONTRACT VALUE:	SCHEDULED COMPLETION:		SERVICE:	SUPERINTENDENT:
$939,700 (original)	November 2024		Water	Jim Wakely
$887,365 (final)				
CONSULTANT:	GENERAL CONTRACTOR:		OWNER:	PROJECT MANAGER:
Mead & Hunt	SGS Contracting Services, Inc.		Town of Pierson	Kiel Kruse
Brad Blais				
DESCRIPTION:				
Installation of potable water strorage tank, well pumps, high service pumps, and chemical feed system.				
TITLE:	LAKE CITY ST. MARGARET'S WWTP REHABILITATION			
CONTRACT VALUE:	SCHEDULED COMPLETION:		SERVICE:	SUPERINTENDENT:
$2,173,300 (original)	June 2024		Wastewater	Tony Culburn
$1,883,872 (final)				
CONSULTANT:	GENERAL CONTRACTOR:		OWNER:	PROJECT MANAGER:
Mittauer	SGS Contracting Services, Inc.		City of Lake City	Seth Simmons
Tim Norman				
DESCRIPTION:				
Misc. plant improvements, including mechanical bar screen, slide gates, centrifuge conveyor system, vertical turbine pumps, concrete rehab & coatings.				
TITLE:	VILLAGES VCSA & LSSA WWTP HEADWORKS IMPROVEMENTS			

CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$1,124,700 (original)	April 2024	Wastewater	Jim Wakley
$1,151,489 (Final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Adkins	SGS Contracting Services, Inc.	Villages Comm. Dev. District	Joby Jett
Contact TBD		Contact TBD	
DESCRIPTION:			
Odor control and headworks improvements, including ductwork, structural lining systems, new odor control equipment and misc. other Plant improvements			

TITLE:	OCALA WTP 1 LIME ACCELERATOR REHAB		
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$1,141,087 (original)	July 2023	Water	TBD
$1,141,087 (final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
N/A	SGS Contracting Services, Inc.	City of Ocala	Seth Simmons
		Scott Hersey	
DESCRIPTION:			
Coating rehab of existing lime acceletor, and partial rehab of accelerator mechanism.			

TITLE:	MARION COUNTY STONECREST WWTF REHABILITATION		
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$791,700 (original)	July 2023	Wastewater	Jim Wakley
$791,700 (final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
N/A	SGS Contracting Services, Inc.	Marion County	Kiel Kruse
		Jeff Lanphere	
DESCRIPTION:			
Rehab of existing DAVCO/Evoqua package plant, including coatings, clarifier, weirs, & aeration.			

TITLE:	CITY OF WINTER SPRINGS EAST & WEST WRF'S PRIORITY REPAIRS		
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$1,669,700 (original)	April 2023	Wastewater	Josh Crowson
$2,307,667 (Final)			Jim Wakely
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
CPH	SGS Contracting Services, Inc.	City of Winter Springs	Joby Jett
Dave Mehler		contact TBD	
DESCRIPTION:			
Misc. Improvements and repairs on three (3) ring steel package plants, including screening improvements and heavy structural steel.			

TITLE:	ST JOHNS CO ANASTASIA ISLAND WWTF UV DISINFECTION IMPROVEMENTS		
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$1,699,700 (original)	December 2022	Wastewater	Clifford Hathcox
$1,744,222 (Final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Constantine	SGS Contracting Services, Inc.	St. Johns County	Seth Simmons
Dave Rasmussen		Teri Person	
DESCRIPTION:			
Modification to existing chlorine contact chamber for the installation of UV disinfection equipment. Includes structural improvements, Metal building, electrical and SCADA improvements.			

TITLE:	CITY OF DELAND WILEY NASH WRF DIGESTER UPGRADES & IMPROVEMENTS		
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$1,656,700 (original)	April 2023	Wastewater	Josh Crowson
$992,293 (Final, due to ODP)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Mead & Hunt	SGS Contracting Services, Inc.	City of DeLand	Seth Simmons
Cassandra Cissell		Jim Alles	
DESCRIPTION:			
Remove and replace existing aeration systems in existing digesters. Includes new blower facility with three (3) blowers, VFD, controls and significant electrical upgrades.			

TITLE:	TOWN OF TRENTON CDBG NR 19 WTF & WWTF IMP		
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$321,700 (original)	January 2022	Wastewater	Clifford Hathcox
$321,700 (Final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Mittauer & Associates	SGS Contracting Services, Inc.	Town of Trenton	Joby Jett
Jason Shepler			
DESCRIPTION:			
Misc. Improvements at each facility, including flowmeters, clarifier, pumping and screening improvements.			

TITLE:	CITY OF HIGH SPRINGS POTABLE WELL #3		
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$664,700 (original)	March 2023	Water	Joe Gore
$739,904 (current)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Saltus Engineering	SGS Contracting Services, Inc.	City of High Springs	Joby Jett
David Bolam		Bruce Gillingham	
DESCRIPTION:			
Construction of new potable water production well, associated piping, controls, and electrical			

TITLE:	ST CLOUD WTP #1 HYDROGEN SULFIDE PRETREATMENT SYSTEM		
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$1,105,170 (original)	September 2022	Water	Joe Gore
$1,105,170 (final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:

Reiss Engineering	SGS Contracting Services, Inc.	City of St Cloud	Joby Jett
DESCRIPTION:			
Construction of a hydrogen sulfide pretreatment system, including odor control system, duct, piping, electrical, and controls.			

TITLE: HAINES CITY WWTP DISC FILTER PROJECT			
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$1,344,700 (original)	September 2022	Wastewater	Jim Wakely
$1,361,173 (final)			Joe Gore
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Reiss Engineering	SGS Contracting Services, Inc.	City of Haines City	Kiel Kruse
DESCRIPTION:			
Construction of two (2) new disc filter units, modifications of existing filter basin, large yard piping, electrical and controls.			

TITLE: FERNANDINA BEACH WRF CLARIFIER #1 IMPROVEMENTS			
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$434,700 (original)	July 2022	Wastewater	Tony Colburn
$434,700 (final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
N/A	SGS Contracting Services, Inc.	City of Fernandina Beach	Seth Simmons
		Charles George	
DESCRIPTION:			
Replacement of 80' diameter clarifier mechanism and weirs/baffles.			

TITLE: LAKE CITY SM WWTF AERATOR REPLACEMENT PROJECT			
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$1,471,700 (original)	May 2022	Wastewater	Tony Colbrun
$2,327,450 (final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Mittauer & Associates	SGS Contracting Services, Inc.	City of Lake City	Seth Simmons
Tim Norman		Cody Prigeon	
DESCRIPTION:			
Replacement of oxidation ditch aeration equipment. Includes grit removal/disposal services for aeration basins.			

TITLE: CITY OF ORMOND BEACH WRF CHLORINE CONTACT CHAMBER MODIFICATIONS			
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$707,700 (original)	May 2022	Wastewater	Josh Crowson
$695,977 (final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Mead & Hunt	SGS Contracting Services, Inc.	City of Ormond Beach (FL)	Seth Simmons
Brad Biels		Al Waltt	
DESCRIPTION:			
Modification to existing chlorine contact chamber for the installation of new concrete baffle walls. Includes control strategy changes, along with electrical modifications.			

TITLE: TOWN OF WILLISTON WWTF PHASE 1 UPGRADE			
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$641,700 (original)	October 2021	Wastewater	Clifford Hathcox
$641,700 (final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Wright-Pierce	SGS Contracting Services, Inc.	Town of Williston	Joby Jett
Bart Booz			
DESCRIPTION:			
Clarifier rehabilitation, rotor ditch rehab, screening rehab, and misc. electrical improvements.			

TITLE: CITY OF ORMOND BEACH WTP LIME SLUDGE DEWATERING IMPRPOVEMENTS			
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$1,048,700 (original)	June 2021	Potable Water	Josh Crowson
$624,700 (final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
McKim & Creed	SGS Contracting Services, Inc.	City of Ormond Beach (FL)	Seth Simmons
Scott Spooner		Lynn Carter	
DESCRIPTION:			
Replacement of existing lime sludge dewatering centrifuge, including misc. modifications to existing piping systems and structural building members. Includes extensive electrical and integration work. Deductive Change Order issued for ODP of major equipment.			

TITLE: FALKENBURG AWTP BAR SCREEN REPLACEMENT			
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$2,588,700 (original)	July 2021	Wastewater	Jeff Varano
$2,741,028 (final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Brown & Caldwell	SGS Contracting Services, Inc.	Hillsborough County	Joby Jett
		Jim Huntsberger	
DESCRIPTION:		Falkenburg AWTP	
Replacement of bar screens and related equipment, including washers, compactors and conveyance. Includes significant electrical and integration/controls upgrades			

TITLE: EUSTIS ARDICE WTP IMPROVEMENTS			
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$1,387,700 (original)	March 2021	Potable Water	Joe Gore
$1,414,821 (final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Wright-Pierce	SGS Contracting Services, Inc.	City of Eustis	Seth Simmons
Bartt Booz		Daniel Millan	
DESCRIPTION:			
Misc. improvements to existing WTP, including demolition of existing elevated storage tank, construction of new prestressed ground storage tank, high service pump, hydro tank, sitework, piping, electrical and controls.			

TITLE: FGUA FAIRWAYS AT MT. PLYMOUTH WWTP REAPLACEMENT			
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$1,407,700 (original)	November 2020	Wastewater	Joe Gore
$1,337,203 (final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Kimley-Horn	SGS Contracting Services, Inc.	FGUA	Joby Jett
Steve Romano		David Huff	
DESCRIPTION:			
Demolition of existing wastewater plant and construction of new wastewater plant. New plant is Mack Concrete pacakge WWTP. Includes all components commong to such facilities.			

TITLE: PORT ORANGE WRF BAR SCREEN REPLACEMENT			
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$544,700 (original)	January 2021	Wastewater	Josh Crowson
$544,700 (final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:

Mead & Hunt	SGS Contracting Services, Inc.	City of Port Orange	Seth Simmons
Brad Blais; 386-761-6810		Steve Parnell	
DESCRIPTION:			
Replacement of existing mechanical bar screens and access stairs. Includes electrical and instrumentation.			

TITLE:	CITY OF FLAGLER BEACH WTP ELECTRICAL BUILDING		
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$473,700 (original)	September 2020	Water	Troy Haines (Foreman)
$473,700 (final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Mead & Hunt	SGS Contracting Services, Inc.	City of Flagler Beach	Joby Jett
Kevin Lee; 386-761-6810			
DESCRIPTION:			
Installation of new electrical building, including new gear, controls, and misc. yard piping.			

TITLE:	NASSAU-AMELIA WWTF CLARIFIER REHAB PROJECT		
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$797,700 (original)	September 2020	Wastewater	Clifford Hathcox
$827,600 (final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
GAI Consultants	SGS Contracting Services, Inc.	Nassau County	Seth Simmons
Jay Ameno			
DESCRIPTION:			
Complete rehabilitation of two (2) existing clarifiers, including new process equipment, coatings, and aluminum walkways.			

TITLE:	CITY OF ORMOND BEACH WWTP SLUDGE DEWATERING UPGRADES & RE-AERATION BASIN IMPROVEMENTS		
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$1,629,700 (original)	June 2020	Wastewater	Josh Crowson
$1,629,700 (final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Mead & Hunt	SGS Contracting Services, Inc.	City of Ormond Beach	Seth Simmons
Brad Blais; 386-761-6810		Lynn Carter	
DESCRIPTION:			
Replacement of 2 existing centrifuges, sludge grinders, polymer feed equipment and related systems. Includes modifications to existing Re-aertion basins, including major bypass and diffuser installation. Installation of new aluminum walkways.			

TITLE:	MARION COUNTY ASHLEY FARMS WTP WELL		
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$449,700 (original)	July 2020	Water	Jeff Varano
$449,700 (final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Kimley Horn	SGS Contracting Services, Inc.	Marion County	Joby Jett
Lewis Bryant		Jeff Lanphere	
DESCRIPTION:			
Misc. modification to existing WTP, including electrical, controls, new well and associated piping.			

TITLE:	MARION COUNTY OAK RUN WWTF ODOR CONTROL IMPROVEMENTS		
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$1,286,700 (original)	May 2020	Wastewater	Jason Kirouac
$1,256,366 (final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Pigeon - Roberts & Associates	SGS Contracting Services, Inc.	Marion County	Seth Simmons
Chuck Pigeon		Jeff Lanphere	
DESCRIPTION:			
Installation of new odor control system including basin and headworks covers. Also includes major coating rehab, structural metals, Piping, electrical and instrumentation.			

TITLE:	MWSRF SODIUM BISULFITE EXPANSION & MISC. DRAINAGE IMPROVEMENTS		
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$370,097 (original)	April 2020	Wastewater	Clifford Hathcox
$370,097 (final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Kimley Horn	Wharton-Smith	Gainesville Regional Utilities (GR	Seth Simmons
	Carlin Dunlap, 321-318-7976		
DESCRIPTION:			
Expansion of existing sodium bisulfite system, including new pumps, tank, pipe systems and misc. drainage improvements around the Site. Also includes chlorine contact chamber expansion and new handrail on entire perimeter of structure.			

TITLE:	ZELLWOOD RD WATER SYSTEM IMPROVEMENTS PART A WTP NO.1 & NO.2		
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$2,740,000 (original)	May 2020	Water	Joe Gore
$2,919,780 (final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Mittauer & Associates	SGS Contracting Services, Inc.	Zellwood Water Users, Inc.	Joby Jett
Kellen Lindsey; 904-278-0030			
DESCRIPTION:			
Upgrades and expansion to existing water treatment plants for the Zellwood Water Users, including construction of new administration Building, storage tanks, generators, wells, electrical, controls.			

TITLE:	BIOSOLIDS CONVEYOR SYSTEM FOR OAK RUN WWTF, SILVER SPRINGS SHORES & STONECREST WWTF'S		
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$419,700 (original)	March 2020	Wastewater	Jason Kirouac
$419,700 (final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Pigeon - Roberts & Associates	SGS Contracting Services, Inc.	Marion County	Joby Jett
Chuck Pigeon		Jeff Lanphere	
DESCRIPTION:			
Installation of biosolids conveyors at 3 facilities for use with mobile centrifuge unit.			

TITLE:	ST JOHNS COUNTY SR16 WWTF FILTER IMPROVEMENTS		
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$776,500 (original)	November 2019	Wastewater	Clifford Hathcox
$775,556 (final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Constantine Engineering	SGS Contracting Services, Inc.	St Johns County Utilities	Seth Simmons
Dave Rasmussen		Teri Pinson; 904-209-2604	
DESCRIPTION:			
Construction of new cloth media filter system, including underground piping, electrical, and controls.			

TITLE:	CITY OF WILDWOOD WWTF PLC UPGRADES & ATS ADDITION		
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$938,700 (original)	November 2019	Wastewater	Joe Gore
$938,700 (final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Kimley Horn	SGS Contracting Services, Inc.	City of Wildwood	Seth Simmons

Trey Cleyton; 352-438-3000				
DESCRIPTION:				
Installation of new plant controls, electrical building and generator ATS.				
TITLE:	CITY OF DAYTONA BEACH BRENNAN WTP LIME SOLIDS CONTACT CLARIFIERS 1-3 REHAB			
CONTRACT VALUE:		COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$788,000	(original)	November 2019	Water	Jason Kirouac
$788,000	(final)			
CONSULTANT:		GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
N/A		SGS Contracting Services, Inc.	City of Daytona Beach	Seth Simmons
		Working under a direct PO from Ovivo Water LLC		
DESCRIPTION:				
Rehabilitation of three (3) lime solids, contact clarifiers, consisting of full sandblasting and high performance coatings and as needed Structural repairs.				
TITLE:	ST JOHNS RIVER INTAKE & FILTRATION			
CONTRACT VALUE:		COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$1,748,000	(original)	July 2019	Wastewater	Josh Crowson
$857,130	(final, due to ODP)			
CONSULTANT:		GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Mead & Hunt		SGS Contracting Services, Inc.	City of DeLand	Seth Simmons
Brad Blais; 386-761-6810				
DESCRIPTION:				
Demolition of existing sand filter and installation of new AquaDiamnod filter system. Also includes installation of new bar screen, misc. Pumps and other improvements at the facility.				
TITLE:	CITY OF CASSELBERRY NORTH WTP HIGH SERVICE PUMP REPLACEMENT			
CONTRACT VALUE:		COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$482,000	(original)	June 2019	Water	Joe Gore
$482,000	(final)			Jeff Varano
CONSULTANT:		GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Kimley-Horn		SGS Contracting Services, Inc.	City of Casselberry	Seth Simmons
			Tara Lamoureux; 407-262-7725	
DESCRIPTION:				
Replacement of existing high-service pumps, electrical, and controls.				
TITLE:	CITY OF DUNEDIN AWTP DENITRIFICATION FILTER REHAB			
CONTRACT VALUE:		COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$697,400	(original)	May 2019	Wastewater	Jeff Varano
$697,400	(final)			
CONSULTANT:		GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
King Engineering		SGS Contracting Services, Inc.	City of Dunedin	Seth Simmons
Loc Truong; 813-880-8881				
DESCRIPTION:				
Replacement of all pneumatically and electrically operated filter control valves (20 total), including the installation of eight (8) line stops In lower-building level upper piping. Valves range from 20" to 10"				
TITLE:	HALIFAX PLANTATION WWTP REHAB			
CONTRACT VALUE:		COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$906,000	(original)	May 2019	Wastewater	Josh Crowson
$906,000	(final)			
CONSULTANT:		GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Mead & Hunt		SGS Contracting Services, Inc.	Volusia County	Seth Simmons
Brad Blais; 386-761-6810				
DESCRIPTION:				
Rehabilitation of two (2) existing package wastewater treatment plants to include significant structural repairs, piping replacements, Handrail and grating replacement, gear drive replacement, new RAS pump station, electrical and controls.				
TITLE:	CHIEFLAND WWTP BIOSOLIDS DIGESTER			
CONTRACT VALUE:		COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$735,000	(original)	April 2019	Wastewater	Clifford Hathcox
$735,000	(final)			
CONSULTANT:		GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Mills Engineering		SGS Contracting Services, Inc.	City of Chiefland	Seth Simmons
Andrew Carswell; 352-486-2872				
DESCRIPTION:				
Construction of new CIP digester, plus accessory pumps and jet aeration system.				
TITLE:	LAKE BUTLER WWTP & RECREATION IMPROVEMENTS			
CONTRACT VALUE:		COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$325,350	(original)	April 2019	Wastewater	Jeff Varano
$325,350	(final)			
CONSULTANT:		GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
ATM		SGS Contracting Services, Inc.	Town of Lake Butler	Seth Simmons
DESCRIPTION:				
Replacement of misc. equipment and the wastewater plant, including pumps, blowers and aeration piping systems. Also includes Installation of public recreation equipment.				
TITLE:	UNIVERSITY OF FLORIDA WWTP BIOSOLIDS IMPROVEMENTS			
CONTRACT VALUE:		COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$1,006,585	(original)	May 2019	Wastewater	Jeff Varano
$1,025,526	(final)			
CONSULTANT:		GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Hazen & Sawyer		The Brentwood Company	University of Florida	Seth Simmons
DESCRIPTION:				
Demolition and removal of existing belt press sludge dewatering equipment and replacement with one (1) new centrifuge for Biosolids thickening. Includes structural concrete, aluminum structures, and heavy process mechanical piping.				
TITLE:	TOWN OF BRANFORD WWTP EFFLUENT STORAGE TANK			
CONTRACT VALUE:		COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$667,000	(original)		Potable Water	Clifford Hathcox
$688,676	(final)			
CONSULTANT:		GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Florida Rural Water Association			Town of Branford	Seth Simmons
			Robbie Lee	
DESCRIPTION:				
Installation of new glass-fused-to-steel ground storage tank, effluent pump station, misc. pumps and piping, and electrical. Includes Structural grouting beneath tank foundation. Rehab of existing spray field.				
TITLE:	WILDWOOD CR-501 WTP IMPROVEMENTS			
CONTRACT VALUE:		COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$382,000	(original)	February 2019	Water	Jeff Varano
$382,000	(final)			
CONSULTANT:		GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Kimley-Horn		SGS Contracting Services, Inc.	City of Wildwood	Seth Simmons
Trey Cleyton; 352-438-3000				

DESCRIPTION:			
Misc. improvements, including installation of new well pumps/motors, underground piping, concrete structures, electrical and Controls improvements.			
TITLE:	LEESBURG TURNPIKE WWTF DEWATERING IMPROVEMENTS		
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$1,487,000 (original)	January 2019	Wastewater	Joe Gore
$1,487,000 (final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Jones Edmunds & Associates	SGS Contracting Services, Inc.	City of Leesburg	Joby Jett
DESCRIPTION:			
Installation of new belt press dewatering facility, including new process equipment, piping, aluminum structures, metal building, Structural concrete and electrical.			
TITLE:	ST JOHNS COUNTY A1A BOOSTER PUMP STATION & GST		
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$1,613,500 (original)	January 2019	Water	Josh Crowson
$1,613,500 (final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Mott-McDonald	SGS Contracting Services, Inc.	St Johns County Utilities Teri Pinson; 904-209-2604	Joby Jett
DESCRIPTION:			
Construction of new booster pump station, including clearing/grubbing, cast-in-place GST, pump station building, high service pumps. Piping, electrical and I & C			
TITLE:	IRISH ACRES WTP (MARION COUNTY)		
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$1,874,970 (original)	January 2019	Water	Clifford Hathcox
$1,861,567 (final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Tillman & Associates	SGS Contracting Services, Inc.	Marion County Utilities Jeff Lanphere	Seth Simmons
DESCRIPTION:			
Expansion of existing WTP, including prestressed storage tank, high service pumps, electrical and pumps buildings, generator yard piping, Instrumentation and electrical.			
TITLE:	FLAGLER BEACH WWTP PHASE II IMPROVEMENTS		
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$794,347 (original)	May 2018	Wastewater	Josh Crowson
$808,635 (final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Quentin L Hampton & Assoc Kevin Lee; 386-761-6810	SGS Contracting Services, Inc.	City of Flagler Beach	Seth Simmons
DESCRIPTION:			
Misc. improvements throughout WWTP facility, including chlorine contact chamber expansion, partial clarifier rehab, installation of Pumps and piping, misc. metals and electrical. Included structural modifications to existing oxidation ditches.			
TITLE:	ORANGE COUNTY NWWRF ODOR CONTROL REPLACEMENT		
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$606,500 (original)	December 2017	Wastewater	Josh Crowson Clifford Hathcox
$606,500 (final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Black & Veatch	SGS Contracting Services, Inc.	Orange County Terra Raffitt; 407-947-9802	Seth Simmons
DESCRIPTION:			
Demolition of existing odor control facilities and installation of new bio-tricking odor control system, including piping, pipe supports, Ductwork, structural concrete, electrical and instrumentation improvements.			
TITLE:	NASSAU-AMELIA WWTF HEADWORKS & AERATION PIPING REHABILITATION		
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$616,212 (original)	November 2017	Wastewater	Shawn Heckman
$891,049 (final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
GAI Consultants Scott Richards; 904-363-1110	SGS Contracting Services, Inc.	Nassau County (FL) Becky Hiers-Bray; 904-530-6225	Seth Simmons
DESCRIPTION:			
Replace existing rotary drum screen, associated support structure, and complete replacement of above-grade aeration piping and valves.			
TITLE:	DADE CITY ORANGE VALLEY WATER FACILITY IMPROVEMENTS		
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$559,000 (original)	November 2017	Water	Josh Crowson
$574,236 (final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Infrastructure Solutions Stephen Bucwinkel; 321-622-4646	SGS Contracting Services, Inc.	City of Dade City	Seth Simmons
DESCRIPTION:			
Misc. modifications and improvements to existing water supply facility, including new pumps, tank modifications, chemical feed system, Structural concrete, electrical and I & C modifications.			
TITLE:	AUBURNDALE/POLYTECHNIC RW GST & PUMP STATION		
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	SUPERINTENDENT:
$535,000 (original)	July 2017	Reclaimed Water	Josh Crowson
$535,000 (final)			
CONSULTANT:	GENERAL CONTRACTOR:	OWNER:	PROJECT MANAGER:
Chastain-Skillman	Crom Corp James Womick; 352-372-3436	City of Auburndale	Seth Simmons
DESCRIPTION:			
Provide all site work and pipe installation for the new 2.0MG tank, constructed by Crom Corp. Includes installation of new high service Pump station, with misc. improvements to electrical and I & C systems (Project date extended for specialty coating requirements)			
TITLE:	ST PETE NEWRF CLARIFIER #4 REHAB		
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	
$432,231 (original)	January 2017	Wastewater	
$432,231 (final)			
TITLE:	CITY OF BARTOW CENTRIFUGE INSTALLATION PROJECT		
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	
$802,411 (original)	August 2016	Wastewater	
$802,411 (final)			
TITLE:	WINTER GARDEN WOODLARK WTP 1.0MG TANK PROJECT		
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	
$543,546 (original)	July 2016	Water	
$543,546 (final)			
TITLE:	RIVERSIDE LIFT STATION REHAB & ODOR CONTROL PROJECT		
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:	
$444,054 (original)	July 2016	Wastewater	
$540,083 (final)			
TITLE:	GRU LS 6 ODOR CONTROL PROJECT		

CONTRACT VALUE:	COMPLETION DATE:	SERVICE:
$179,559 (original)	January 2016	Wastewater
$179,559 (final)		

TITLE:	DAYSPRING HEALTH WTP	
CONTRACT VALUE:	COMPLETION DATE:	SERVICE:
$344,000 (original)	January 2016	Water
$344,000 (final)		

Ron DeSantis, Governor

Melanie S. Griffin, Secretary

Florida dbpr

STATE OF FLORIDA
DEPARTMENT OF BUSINESS AND PROFESSIONAL REGULATION

CONSTRUCTION INDUSTRY LICENSING BOARD

THE UNDERGROUND UTILITY & EXCAVATION CO HEREIN IS CERTIFIED UNDER THE PROVISIONS OF CHAPTER 489, FLORIDA STATUTES

SIMMONS, SETH GARRETT

SGS CONTRACTING SERVICES, INC.
25613 W US HWY 27
HIGH SPRINGS FL 32643

LICENSE NUMBER: CUC1225090

EXPIRATION DATE: AUGUST 31, 2026

Always verify licenses online at MyFloridaLicense.com

ISSUED: 06/18/2024

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Ron DeSantis, Governor

Melanie S. Griffin, Secretary

Florida dbpr

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25613 W US HWY 27
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CITY OF HIGH SPRINGS
BUSINESS LICENSE TAX RECEIPT

DISPLAY RECEIPT IN A CONSPICUOUS PLACE — EXPIRES: 09/30/2026

BUSINESS	SGS Contracting Services Inc
LOCATION	25613 W US HWY 27
LICENSE NUMBER	0061
OWNER	
MAILING ADDRESS	PO Box 908 High Springs, FL 32655

BUSINESS TYPE

Contractors

RESTRICTIONS

FEE

Contractors	$50.25

Valid Only With Signature: _____ Seal

State of Florida
Department of State

I certify from the records of this office that SGS CONTRACTING SERVICES, INC. is a corporation organized under the laws of the State of Florida, filed on October 8, 2012, effective July 25, 2007.

The document number of this corporation is P12000085304.

I further certify that said corporation has paid all fees due this office through December 31, 2026 and that its status is active.

I further certify that said corporation has not filed Articles of Dissolution.

Given under my hand and the Great Seal of the State of Florida at Tallahassee, the Capital, this the Twelfth day of January, 2026



Secretary of State

Tracking Number: 4472073930CC

To authenticate this certificate,visit the following site,enter this number, and then follow the instructions displayed.

https://services.sunbiz.org/Filings/CertificateOfStatus/CertificateAuthentication

COPY

IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

BID BOND

STATE OF FLORIDA
COUNTY OF ST. JOHNS

KNOW ALL MEN BY THESE PRESENTS, that SGS Contracting Services, Inc. as Principal, and Great American Insurance Company as Surety, are held and firmly bound unto St. Johns County, Florida, in the penal sum of 5% OF BID AMOUNT Dollars ($ 5% OF BID) lawful money of the United States, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATIONS IS SUCH that whereas the Principal has submitted the accompanying Bid, dated August 19th, 2026.

For
North Beach Water Treatment Plant Improvements
St. Johns County, Florida

NOW THEREFORE,

(a) If the Principal shall not withdraw said Bid within ninety (90) days after Bid Award date, and shall within ten (10) days after prescribed forms are presented to him for signature, enter into a written Contract with the County in accordance with the Bid as accepted, and give Bond with good and sufficient Surety or Sureties, as may be required, for the faithful performance and proper fulfillment of such Contract, then the above obligations shall be void and of no effect, otherwise to remain in full force and virtue.

(b) In the event of the withdrawal of said Bid within the period specified, or the failure to enter into such Contract and give such Bond within the time specified, if the Principal shall pay the County the difference between the amount specified, in said Bid and the amount for which the County may procure the required Work and supplies, if the latter amount be in excess of the former, then the above obligations shall be void and of no effect, otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above bounded parties have executed this instrument under their several seals, this day of August 19th A.D., 2026, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

WITNESSES:

(If Sole Ownership or Partnership two (2) Witnesses required).
(If Corporation, Secretary only will attest and affix seal).

WITNESSES:

SGS Contracting Services, Inc.
PRINCIPAL:

SGS Contracting Services, Inc.
NAME OF FIRM:

SIGNATURE OF AUTHORIZED OFFICER (AFFIX SEAL)

SGS CONTRACTING SERVICES, INC. CORPORATE SEAL 2007 FLORIDA

Seth G. Simmons,President
TITLE

25613 West U.S. Highway 27
BUSINESS ADDRESS

High Springs, FL 32643
CITY STATE

Great American Insurance Company
SURETY:

WITNESS:

Sandra Gonsalves

Great American Insurance Company
CORPORATE SURETY

Jorge I. Bracamonte ATTORNEY-IN-FACT & Florida Resident
Agent(AFFIX SEAL)

301 East 4th Street
BUSINESS ADDRESS

Cincinnati, OH 45202
CITY STATE

JCA Surety Group, LLC
NAME OF LOCAL INSURANCE AGENCY

Inquiries: 321-800-6594

GREAT AMERICAN.
INSURANCE GROUP
Bond Division

August 18th, 2026

Re: **SGS Contracting Services, Inc.**
25613 W. US Hwy 27
High Springs, FL 32643

Dear Selection Committee Members,

It is a privilege for JCA Surety Group, LLC. to be the agency handling the bonding needs of SGS Contracting Services, Inc. Bonds are placed with Great American Insurance Company which has an AM Best Rating of A+ (Superior), XV and is listed on the US Treasury Department's list of Approved Sureties.

SGS Contracting Services, Inc. has a reputation for holding itself to the highest standards of quality and displaying the utmost integrity. Prudent surety underwriting requires our satisfaction of financial ability, experience, and personnel. SGS Contracting Services, Inc. has our complete confidence in these areas.

While maximum limits have not been established, Great American Insurance Company favorably considers single projects in the $50,000,000.00 range, with an aggregate program around $100,000,000.00 to be within their normal operating capacity. Should you require Performance and Payment bonds from SGS Contracting Services, Inc. we would be pleased to execute the required documents. This is subject to the Surety's normal underwriting requirements at the time any request is made, including without limitation, prior review and approval of relevant contract documents and bond forms.

Please note that this letter is not an assumption of liability. Any arrangement for bonds required by the contract is a matter between SGS Contracting Services, Inc. and the surety and we assume no liability to you or third parties.

Should you have any questions or require additional information please do not hesitate to contact me at (321) 800-6594 or (407) 575-4361

Sincerely,

Jorge L. Bracamonte

Attorney-In-Fact

Board of County Commissioners
St. Johns County, Florida

INVITATION FOR BIDS NO: 2995

NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

St. Johns County Purchasing & Contracts Department
4040 Lewis Speedway
St. Augustine FL 32084
(904) 209-0150
www.sjcfl.us/departments/purchasing/

Final: 7/8/2026

IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

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PART I – GENERAL TERMS AND CONDITIONS

1) DEFINITIONS

Terms used within this Invitation for Bids ("IFB") shall have the meaning as set forth in the St. Johns County Purchasing Policy ("Policy"), or as otherwise defined herein. Any definition specifically provided herein, shall govern over the definitions provided in the Policy.

2) COMPLIANCE WITH ST. JOHNS COUNTY PURCHASING POLICY

All applicable provisions of the Policy and associated procedures are incorporated into the IFB Documents by reference and are fully binding. Bidders are required to submit their Bids, and to conduct their activities in accordance with the Policy and associated procedures.

3) PURPOSE

The purpose of this IFB is to solicit Bids from qualified Bidders to furnish all labor, materials, equipment, and incidentals required to access site and construct a new treatment building to include new RO feed pumps, RO skids, high service pumps, clean-in-place tank and pump, anti-scalant tank and skid, electrical room and gear, air conditioning, restroom and storage. In addition to the building, the project will include demolition of the existing treatment building and existing rectangular storage tank, new transformer and pad, generator, new plant control system and integration to SCADA, relocation of sodium hypochlorite tank and skid, site grading and drainage, and yard piping modifications as shown on the Drawings and as specified herein. The generator, fuel tank, ATS, and electrical equipment are to be provided by the County as noted in Exhibit A, Exhibit C and Exhibit D.

4) BIDDER'S REPRESENTATION

By submitting a Bid, Bidder represents and warrants that Bidder has read and understands all information and requirements provided herein, and that Bidder is familiar with and understands all conditions related to the Work specified herein, and the submitted Bid is based upon all necessary considerations to perform the Work in accordance with all plans, specifications, and requirements provided herein, or as otherwise provided in an Addendum. Bidder also represents that any and all costs associated with performing the specified Work are included in the submitted Bid.

5) IFB DOCUMENTS

The IFB Documents are those documents which shall govern the solicitation, submittal, consideration and award of submitted Bid(s), which generally includes, but is not limited to: IFB Documents, Specifications, Plans, Drawings, and all issued Addenda.

IFB Documents may be obtained from www.demandstar.com or from the SJC Purchasing & Contracts Department Designated Point of Contact. The IFB Documents shall be used by Bidders to prepare their Bid for submittal. St. Johns County ("County") shall not assume any responsibility for errors or misrepresentations resulting from the use of complete or incomplete sets of IFB Documents. The County, in making the IFB Documents available, do so only for the purpose of obtaining Bids for the specified purpose and do not confer a license or grant for any other use.

6) INTERPRETATION OR CORRECTION OF IFB DOCUMENTS

Bidders shall promptly notify the Designated Point of Contact of any ambiguity, inconsistency, or error which they may discover upon examination of the IFB Documents or of the site and local conditions. Bidders requiring clarification or interpretation of the IFB Documents shall make a written request to the Designated Point of Contact by or before the deadline for questions as provided herein.

An interpretation, correction or change of the IFB Documents will be made by Addendum. Interpretations, corrections, or changes of the IFB Documents made in any other manner will not be binding, and Bidders must not rely upon such interpretations, corrections, or changes. No change will be made to the IFB Documents by the

County less than seven (7) days prior to the submittal deadline for Bids. The County, however, reserves the right to issue addendums at any time prior to the submittal deadline for Bids in order to serve the best interest of the County.

7) SUBSTITUTIONS

The materials, products and equipment described in the IFB Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution. No substitution will be considered unless written request for approval has been received by the Designated Point of Contact at least fourteen (14) calendar days prior to the submittal deadline for Bids. Each such request shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitute, including drawings, cuts, performance and testing data, and any other information necessary for an evaluation. A statement setting forth any changes in other materials, equipment or work that incorporation of the substitute would require must also be included. The burden of proof of the merit of the proposed substitute is upon the proposer of the substitute. The Project Manager's approval or disapproval of a proposed substitution shall be final.

If County Staff approves any proposed substitution, such approval will be set forth in an Addendum. Bidders must not rely upon approval made in any other manner.

8) NON-MANDATORY PRE-BID MEETING/SITE VISIT

There will be a **Non-Mandatory Pre-Bid Meeting/Site Visit** on **Tuesday, July 21, 2026** at **9:00 AM EDT** at the SJC North Beach Water Treatment Plant located at 415 Nineteenth St., St. Augustine FL 32084. Attendance is strongly recommended but is not required at the Pre-Bid Meeting/Site Visit in order to be eligible to submit a bid for this project. Bidders and sub-contractors are highly encouraged to visit the site prior to Non-Mandatory Pre-Bid Meeting/Site Visit to familiarize themselves with the site and any conditions that may pose a conflict during the course of construction.

9) DESIGNATED POINT OF CONTACT

The County's Designated Point of Contact for this IFB is Richard E. Poulin Jr., Procurement Coordinator, St. Johns County Purchasing & Contracts Department. Any and all questions and/or inquiries shall be directed to Richard E. Poulin Jr. ***in writing***, via email at rpoulin@sjcfl.us. In the event the Designated Point of Contact is absent or otherwise unavailable for more than three (3) business days, firms may contact Ms. Diana Fye, Senior Procurement Coordinator at dfye@sjcfl.us.

10) QUESTIONS

Any and all questions related to this project shall be directed, ***in writing***, to the Designated Point of Contact. Questions are due no later than Four o'clock **(4:00PM) EDT** on **Friday, July 31, 2026,** so that any necessary addenda may be issued in a timely manner. Any questions received after the deadline will not be answered unless previously approved by the SJC Purchasing Director or other designated County Representative.

11) LOBBYING PROHIBITION

In accordance with Section 9 of the Policy, Bidders **SHALL NOT** contact any staff member of the County, including members of the Board of County Commissioners, except the above referenced Designated Point of Contact with regard to this Invitation for Bids. Any such communication is a violation of the Policy and shall result in disqualification and removal from consideration for award under this IFB.

12) ADDENDA

Any change, clarification, revision, deletion, additional documents or information provided by the County after broadcast of this IFB will be provided via Addendum and posted to Demandstar (www.demandstar.com) with the IFB Documents. All planholders for this IFB will be notified of the posted addendum by Demandstar. Planholders may access and download issued Addenda for inclusion in their submitted Bid. Bidders may also request issued addenda from the Designated Point of Contact, in writing. It is the responsibility of the Bidder to acquire any addenda issued by the County. The County is not responsible for a Bidder's failure to obtain any issued Addendum. Bidders are responsible for incorporating any and all changes, clarifications, revisions, deletions, additional

documents and information provided by Addendum into the submitted Bid. Failure by the Bidder to appropriately consider and incorporate the addenda into their submitted Bid may cause the submitted Bid to be considered non-responsive and removed from further consideration. It shall be the sole discretion of the Purchasing Manager or Purchasing Director to determine whether or not an Addendum is material to the submitted Bid, resulting in disqualification and removal from consideration for award.

Each Bidder shall acknowledge all issued Addenda in the submitted Bid by completing and submitting **Attachment "O" – Acknowledgement of Addenda** with the sealed Bid.

13) BID SUBMITTAL REQUIREMENTS

The Submittal Deadline for Bids shall be no later than two o'clock **(2:00PM EDT) on Wednesday, August 12, 2026.** Bids must be submitted to:

SJC Purchasing & Contracts Department
4040 Lewis Speedway
St. Augustine, FL 32084

All mail delivered to the County is processed through SJC Central Receiving. Bidders must factor the additional time for processing when mailing their submitted Bids to the County. Any Bids that are not delivered to the SJC Purchasing & Contracts Department, by the deadline above, shall not be considered, even if the Bid is delivered to SJC Central Receiving prior to the deadline above. SJC Purchasing & Contracts Department is not responsible for Bids that are delayed in delivery due to mail processing activities of the County's Central Receiving Office.

Bidder shall assume full responsibility for timely delivery of their submitted Bid at the location designated above for receipt of Bids. Bids shall be delivered to the designated location prior to the submittal deadline provided above, or as revised by addendum. Bids received after the established submittal deadline will not be considered and will be returned to the sender unopened.

Additionally, the County is not responsible for Bids that are incorrectly labeled, addressed, mailed, or otherwise delivered to an incorrect location other than the SJC Purchasing & Contracts Department. Any such Bid that is not received in the SJC Purchasing & Contracts Department shall be returned to the Bidder, unopened.

Each Bidder must submit one (1) original hard copy, on the required forms provided herein, in a sealed envelope or container plainly marked with the Bidder's full legal company name, mailing address, and recite: "**IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS**". A mailing label has been provided herein for Bidders to use to identify their Bid.

All required forms and attachments, including the Official County Bid Form, must be completed, and all required information provided. Information must be typewritten or manually written in blue or black ink. Each Bid must include the Bidder's full legal company name, mailing address, telephone number, and must identify whether the Bidder is a sole proprietor, partnership, corporation or other legal entity. **The submitted Bid should NOT include a full copy of the IFB General Terms and Conditions.** Oral, telephonic, telegraphic, or electronic Bids are invalid and will not receive consideration.

Where so indicated by the makeup of the Bid Form, sums shall be expressed in both words and numerals, and in the case of a discrepancy between the two, the amount expressed in words shall govern. Additionally, where there are unit prices and extended prices, the unit prices shall govern over extended pricing.

Any interlineations, alterations, or erasures by the Bidder on the Bid Form must be initialed by the signer of the Bid. Failure to do so may cause the Bid to be considered non-responsive.

Bidder shall make no stipulation on the Bid Form, nor qualify the submitted Bid in any manner. To do so will classify the Bid as being non-responsive.

Any submitted Bid must be signed by a principal of the Bidder, or other legally authorized to bind the Bidder to a contract. In the event the Bid is signed by a representative who is not a principal of the Bidder, a Delegation of Authority Letter must be submitted with the Bid, stating the delegation of authority by principal(s), owner(s), or officer(s) of the Bidder for the signing representative. The delegation of authority must be signed by the principal/owner/officer of the Bidder and must state the limits and duration of the delegation to the signing representative.

A Bid submitted by an agent must have a current Power of Attorney attached, certifying the agent's authority to bind the Bidder.

All Bids submitted in response to this IFB shall become the property of the County and will not be returned to the Bidders. In the event of an award, all documentation produced as part of the award shall become exclusive property of the County.

14) BID SECURITY

Each submitted Bid must be accompanied by a Bid Security, submitted on the Bid Bond Form provided herein, or in the form of a certified or cashier's check, in the amount of **five percent (5%) of the Total Project Bid Price** submitted on the Official County Bid Form, pledging that the Bidder will enter into a contract with the County on the terms stated in the IFB and will, if required, furnish bonds as described hereunder covering the faithful performance of the Contract and the payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds to the County, if required, the amount of the Bid Security shall be forfeited, not as penalty, but as liquidated damages.

A Bid Security in the form of a certified or cashier's check must be made payable to the Board of County Commissioners of St. Johns County. Bidders submitting a certified or cashier's check as the bid security are not required to submit **Attachment "B" – Certificate as to Corporate Principal**, or the Bid Bond forms provided herein.

A Bid Security in the form of a Bid Bond shall be written on the form provided herein, with an acceptable surety, and the Attorney-in-Fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of his Power of Attorney. Acceptable surety companies are defined herein under "Surety Bond". The Surety Company shall be licensed to do business in the State of Florida and shall be listed by the U.S. Treasury Department. Any Bidder submitting a Bid Security in the form of a Bid Bond must also submit **Attachment "B"**.

The County shall have the right to retain the Bid Security until either (a) a Contract is executed and bonds, if required, have been furnished, or (b) the County has rejected all Bids, or (c) the period of time for which Bids are irrevocable has elapsed, so that Bids may be withdrawn.

15) BID BOND INSTRUCTIONS

A Bid Bond submitted, on the form provided herein, must be completed as follows:

- Type or Print Bidder's and Surety's names, mailing addresses, in the same language as in the IFB Documents;
- Have authorized representatives of the Bidder and Surety/Surety's Agent sign in the designated spaces;
- Attach a copy of Surety agent's Power of Attorney with an original signature of the Secretary or Assistant Secretary of Surety certifying the copy, unless the Power of Attorney has been recorded in St. Johns County. If it has been recorded, provide book and page number.
- Submit one (1) original and one (1) duplicate, as prescribed herein for Submittal of Bids.

16) SURETY REQUIREMENTS

Any Surety issuing a Bond to the County, must meet the following requirements:

- Surety must be licensed to do business in the State of Florida;
- Surety must have a record of successful continuous operations for at least three (3) years;
- Surety shall not have exposed itself to any loss on any one risk in an amount exceeding twenty percent (20%)

of its surplus to policyholders;
- Surety must have fulfilled all of its obligations on all other bonds given to the County;
- Surety must have good underwriting, economic management, adequate reserves for undisclosed liabilities, and net resources for unusual stock and sound investment.

17) BID POSTPONEMENT/CANCELLATION

The County may, at its sole and absolute discretion, postpone or cancel this IFB, and/or resolicit Bids in order to serve the best interest of the County.

18) MODIFICATION OR WITHDRAWAL OF BID

A submitted Bid may not be modified, withdrawn or canceled by the Bidder after the Submittal Deadline for Bids, as specified herein.

Prior to the Submittal Deadline for Bids, a submitted Bid may be modified or withdrawn by the Bidder only by written notice to the Designated Point of Contact. Upon notice from a Bidder to modify or withdraw a submitted Bid, provided such notice is received prior to the Submittal Deadline for Bids, the County shall return the Bid to the Bidder unopened. Any modified Bids must be submitted prior to the Submittal Deadline for Bids, in order to be considered.

19) COSTS INCURRED BY BIDDERS

Bidders are responsible for any and all costs associated with developing and submitting a Bid in response to this IFB. Additionally, Bidders are solely responsible for any and all costs associated with providing any subsequent information requested by the County, attending any meetings with the County, and any other activities related to this solicitation and subsequent award proceedings. It is expressly understood, no Bidder may seek or claim any award and/or reimbursement from the County for any expenses, costs, and/or fees (including attorney's fees) borne by any Bidder, during the IFB process. Such expenses, costs, and/or fees (including attorney's fees) are the sole responsibility of the Bidder.

20) CONSIDERATION OF BIDS

Opening of Bids: Unless stated otherwise in an Addendum, Bids received by or before the Submittal Deadline will be opened publicly, immediately after the Submittal Deadline provided herein. The Bid Tabulation shall be posted to DemandStar, upon verification of Bids and all information.

Rejection of Bids: The County reserves the right to reject any or all Bids that are not materially responsive to the requirements provided herein, Bids submitted by a non-responsible Bidder, or if it is determined to be in the — of the County. The County may also waive any minor formality or irregularity of any submitted Bid, provided the minor formality or irregularity does not materially impact the submitted Bid.

Bid Award: It is the intent of the County to award to the lowest, responsive, responsible Bidder, based upon the Lump Sum Bid Price.

The County shall have the right to accept alternates in any order or combination and to determine the low Bidder on the basis of the sum of the Lump Sum Bid Price and/or the Alternates accepted if alternate bids are requested in the Official County Bid Form. The County is under no obligation to award any Bid Alternates, unless it serves the best interest of the County to do so.

If an award is made, it will be made within ninety (90) days from the date of the Bid opening, unless stated otherwise in an Addendum. Submitted Bids must remain valid for a minimum of ninety (90) days from the date of the Bid opening, and shall be irrevocable during this time unless otherwise agreed to by the County.

If only one (1) Bid is received, the County reserves the right to negotiate with the responding Bidder, if the submitted Bid is responsive to the requirements provided herein, and Bidder is deemed responsible to complete

the Work. The Bid may also be rejected and the IFB re-advertised, in order to best serve the needs of the County.

21) PAYMENTWORKS REGISTRATION

The County has implemented a registration process for awarded Suppliers, which includes Contractors and Consultants ***even*** if the Supplier, Contractor, or Consultant is currently or has previously done business with the County. This process is through PaymentWorks, a third-party payee management system. Upon award, Supplier will receive an invitation to register from the County Purchasing & Contracts Department, via email, which will originate from the PaymentWorks system.

If a Supplier has already registered within PaymentWorks, the registration does not have to be done again. However, in order to link the Supplier's current account with the County in PaymentWorks, the Supplier must provide the email to the person that is used on the Supplier's current account in PaymentWorks. The Supplier is responsible for completing the registration process for acceptance by the County, in order to receive any payments. The County **cannot** edit, input and/or bypass any portion of the registration for the Supplier. If there are any questions about this process, Suppliers can reach out to Joanie Chiarelli at jchiarelli@sjcfl.us or Leanne Burke at lburke@sjcfl.us.

22) PROTESTS

Any actual Bidder who is aggrieved in connection with the Notice of Intent to award a Contract (Protestor), where such grievance is asserted to be the result of a violation of the requirements of the County's Purchasing Policy and associated procedures, or any applicable provision of law by the officers, agents, or employees of the County, may file a Protest with the Purchasing Director. The Protest must be submitted in writing, accompanied by a security in the form of a Protest Bond, by 4:00PM on the fifth business day following the date of the posting of the Notice of Intent to Award.

23) MINIMUM QUALIFICATIONS

The following are minimum qualification requirements that Bidders must meet in order to be considered responsible to perform the work specified in this IFB. Bidders must submit sufficient documentation in their Bid Submittal, to clearly demonstrate that the Bidder meets or exceeds the following minimum qualification requirements:

a. Bidder must be **actively registered with the State of Florida Division of Corporations** as of the submittal deadline for Bids; and

b. Bidder must provide a copy of a **current Local Business Tax Receipt from St. Johns County** or from the local jurisdiction in the State of Florida where the Bidder's permanent business location or branch office is maintained, or provide written exemption from the SJC Tax Collector's Office. If Bidder does not possess a current Local Business Tax Receipt from St. Johns County or from their local jurisdiction, as provided above, Bidder must obtain such required Local Business Tax Receipt upon notification of the County's intent to award the Bidder.

c. Bidder must be currently licensed as a **Certified General Contractor (CGC) in the State of Florida** as of the submittal deadline for Bids.

d. Bidder or Subcontractor must be currently licensed as a **Certified Building Manufacturer (MB) and Certified Erector (ME) in the State of Florida** as of the submittal deadline for Bids.

e. **Bidder must submit a list of any and all relevant experience with the proposed scope of work and shall illustrate that they have the required experience with structural work associated with Water Treatment Plants as listed in Exhibit A within the past 5 years (submit with Attachment "C" – License/Certification List)**. The list must include the Client's information, total contract value, completion timeframes and Architect/Engineer of record with the bid. The Experience submitted shall be evaluated to determine whether or not Bidder is responsible to complete the Work. The County reserves the right to check any and all

references. Failure to submit documentation to demonstrate experience as stated above shall cause a Bid to be disqualified.

f. **The Bidder is to submit a Letter of Bonding Capability and Capacity from the Bidder's Surety (not the agent) demonstrating the level of bonding capability/capacity held by the Bidder is a minimum of $4 million dollars.** Surety must be licensed to do business in Florida, have been in business and have a successful continuous operations for at least three (3) years. Surety shall not have exposed itself to any loss on any one risk in an amount exceeding twenty percent (20%) of its surplus to policyholders. Surety must have fulfilled all of its obligations on all other bonds given to the Owner. Surety must have good underwriting, economic management, adequate reserves for undisclosed liabilities, net resources for unusual stock, and sound investment and have an "A" rating or better.

g. Bidders must provide proof of qualifications by completing and submitting **Attachment "C" – License/Certification List** along with a copy of each required license and certificate listed or a letter from FDOT confirming pre-qualification in the required work classes. All licenses, certifications, and FDOT pre-qualifications must be valid and current on the date bids are submitted. A copy of the form, **Attachment "C"** – License/Certification List, is provided in the IFB Document for Bidders to provide proof of the Minimum Qualifications stated above.

FAILURE BY A BIDDER TO DEMONSTRATE MEETING OR EXCEEDING THE MINIMUM QUALIFICATION REQUIREMENTS STATED ABOVE SHALL BE GROUNDS FOR DISQUALIFICATION AND REMOVAL FROM FURTHER CONSIDERATION FOR AWARD. The County reserves the right to request additional information regarding the qualification and experience of the Bidder in order to determine the responsibility of the Bidder to perform the specified work.

Bidders to whom award of a contract is under consideration shall submit to the County, upon request, a properly executed Contractor's Qualification Statement of A1A Document A305, or other similar forms, unless such a statement has been previously required and submitted by Bidder for this IFB.

24) SUB-CONTRACTORS

Each Bidder shall submit to the County, on **Attachment "D"** provided herein, a list of proposed Subcontractors and major materials suppliers for this Work. If no Subcontractors or major material suppliers are proposed, so state there on.

Upon request by the County, the successful Bidder shall within seven (7) days thereafter, submit all data required to establish to the satisfaction of the County, the reliability and responsibility of the proposed Subcontractors to furnish and perform the work described in the Sections of the Specifications pertaining to such proposed Subcontractor's respective trades.

Prior to the award of the Contract, the County will notify the Bidder in writing if the County, after due investigation, has reasonable and substantial objection to any person or organization proposed as a Subcontractor. The Bidder then may, at his option, withdraw his Bid without forfeiture of Bid Security or submit an acceptable substitute at no increase in Bid price. If the Bidder fails to submit an acceptable substitute within seven (7) days of the original notification, the County may then, at its option, disqualify the Bidder, at no cost to the County.

The County reserves the right to disqualify any Contractor, Subcontractor, Vendor, or material supplier due to previously documented project problems, either with performance or quality.

Subcontractors and other persons and organizations proposed by the Bidder and accepted by the County, must be used on the work for which they were proposed and accepted and shall not be changed except with the written approval of the County.

25) FLORIDA TRENCH SAFETY ACT

Bidders shall complete **Attachment "N" - Certificate of Compliance with Florida Trench Safety Act**, in accordance with the requirements of Chapter 553, Florida Statutes. If trenching is not required for this project, state so thereon. Contractor shall be responsible for compliance with all trenching shoring safety requirements.

26) PUBLIC CONSTRUCTION BOND

The awarded Contractor shall be required to obtain and submit a recorded Public Construction Bond covering the faithful performance of the Contract and the payment of all obligations arising thereunder in full amount of the awarded Contract, with such acceptable sureties, secured through the Bidder's usual sources as may be agreeable to the parties. The Contractor shall furnish the required bond, after full execution of the awarded Contract. The Bond shall be released upon satisfactory completion of the project.

The Public Construction Bond form will be provided to the awarded Contractor with the fully executed contract. The Contractor shall provide the recorded Public Construction Bond to the County within three (3) business days of receipt of the bond form and executed contract. **The Public Construction Bond must be recorded after the contract is signed by all parties.**

Contractor shall record the Public Construction Bond with the St. Johns County Clerk of Courts, and obtain a certified copy of the recorded bond and provide to the SJC Purchasing & Contracts Department. No work shall commence until the required bond has been delivered to the Owner. Upon receipt of the certified copy of the recorded bond, the Owner may issue a Notice to Proceed.

Unless otherwise specified in the IFB Documents, the bonds shall be written on the form provided herein. The Bidder shall require the Attorney-in-Fact who executes the required bonds on behalf of the Surety to affix thereto a certified and current copy of his Power of Attorney authorizing his firm to act as agent for the Surety in issuing the bonds.

27) FORM OF AGREEMENT BETWEEN COUNTY AND CONTRACTOR

Unless otherwise provided in the IFB Documents, the Agreement for Work will be written on the St. Johns County Master Construction Agreement.

28) EXECUTION OF CONTRACT DOCUMENTS

The awarded Contractor shall return signed copies of the Contract Agreement to the SJC Purchasing & Contracts Department within ten (10) consecutive calendar days of receipt of Notice of Award. St. Johns County shall return a fully executed original copy of the Contract Agreement to the Contractor no later than seven (7) consecutive calendar days after the return of the signed copies from the Contractor.

29) CONTRACT TIME – LIQUIDATED DAMAGES

The Contractor shall have ten (10) days to return Contract originals from the time the Contractor receives a "Notice of Award". St. Johns County will return a "fully executed" Contract to the Contractor no later than seven (7) days after the return of the executed Contract originals (but no later than seventeen (17) days from the Notice of Award).

The Contractor will furnish a recorded original certified copy of the Public Construction Bond three (3) business days after receipt of the fully executed Contract (the Public Construction Bond must be recorded after the Contract is fully executed by all parties including the County Clerk). Upon receipt of the recorded Public Construction Bond, the County will issue a Notice to Proceed. If the Contractor fails to meet any of the dates and timeframes set forth in this section, or fails to execute the Contract, or to provide a Public Construction Bond, the County may elect at its option to consider the Contractor non-responsive and Contract with the next lowest, responsible Bidder.

The work to be performed under this Agreement shall be commenced within ten (10) days of the date of the Notice to Proceed, in writing. Construction of the project shall be substantially complete within **Ninety (90)** consecutive calendar days from the date stipulated on the Notice to Proceed. Final completion shall be attained **Thirty (30)** consecutive calendar days from the date of substantial completion.

Conditions under which Liquidated Damages are Imposed:
If Contractor fails to achieve Substantial Completion of the Work by its applicable date, then the County shall be entitled to withhold from any amounts otherwise due Contractor or to be paid as a debt due the sum of **Two Thousand Three Hundred Seventy-Six Dollars and Zero Cents ($2,376.00) or** fails to achieve Final Completion in the amount of **Two Thousand One Hundred Ninety-Six Dollars and Zero Cents ($2,196.00)** for each and every calendar day of unexcused delay as "Liquidated Damages". The parties agree that such Liquidated Damages are not a penalty but rather a genuine pre-estimate of monetary damages sustained by the County for loss of revenue and/or increased project administration expenses related to this Contract because the Contractor failed to perform and complete Work within the time fixed for completion or additional time granted pursuant to the provisions hereof. The assessment of Liquidated Damages is without prejudice to the County's rights of termination and Contractor's obligation to complete the Work.

Should Contractor fall behind the approved Work schedule; the County reserves the right to deduct Liquidated Damages based on an estimated period of late completion. The County need not wait until the completion of Work to withhold Liquidated Damages from the Contractor's progress payments.

30) INDEMNIFICATION

Contractor shall indemnify and hold harmless the County and its officers and employees ("Indemnified Party"), from liabilities, damages, losses and costs, including, but not limited to, reasonable attorney's fees, to the extent caused by the negligence, recklessness, or intentional wrongful misconduct of Contractor and persons employed or utilized by Contractor in the performance of this Contract.

To the extent permitted by, and in accordance with Section 725.06 of the Florida Statues, Contractor further agrees that "damages, losses and costs", includes fines, citations, court judgments, insurance claims, restoration costs or other liability, to the extent caused by the negligence, recklessness, or intentional wrongful misconduct of Contractor and persons employed or utilized by Contractor in performance of the Work.

To the extent permitted by, and in accordance with Section 725.06 of the Florida Statues, for purposes of indemnity, the "persons employed or utilized by Contractor" shall be construed to include, but not be limited to, Contractor, its staff, employees, subcontractors, all deliverers, suppliers, furnishers of materials or services or anyone acting for, on behalf of, or at the request of Contractor.

In Claims against any person or entity indemnified hereunder by an employee of Contractor, any Subcontractor, or subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under this Section 11.2 shall not be limited by a limitation on the amount or type of damages, compensation or benefits payable by or for Contractor or any Subcontractor or subcontractor under any workers' compensation acts, disability benefits acts or other employee benefit acts.

Contractor's indemnity and hold harmless obligations hereunder shall extend to all Claims against the County by any third party or third-party beneficiary and all liabilities, damages, losses and costs related thereto.

This indemnification will not be valid in the instance where the loss is caused by the gross negligence, or willful, wanton or intentional misconduct of any Indemnified Party.

If any provision(s), or portion(s) of a provision(s) of this Section, or the application thereof to any person or circumstance shall, to any extent, be held to be invalid, illegal or unenforceable for any reason whatsoever, the validity, legality and enforceability of the remaining provision(s), or part of the provision(s), shall not in any way be affected or impaired thereby; and shall be interpreted to the fullest extent possible to be enforceable and to give effect to the intent manifested by the provision(s), or portion(s) thereof, held invalid, illegal or unenforceable.

Contractor shall further indemnify and hold harmless the County its officers and employees from and against all Claims arising out of any infringement of patent rights or copyrights incident to the use in the performance of the

Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents and shall defend such Claims in connection with any alleged infringement of such rights.

The indemnification provisions of this Section shall survive expiration or earlier termination of the Contract.

31) FORCE MAJEURE; DELAYS

Force Majeure: Contractor shall not be liable for failure to carry out the terms of this Agreement to the extent such failure is due to a Force Majeure event, except for failures that could have been reasonably foreseen and guarded against so as to avoid or reduce the adverse impact thereof. A Force Majeure event is hereby defined as the failure to carry out any of the terms of this agreement due to any one of the following circumstances beyond the control, and not reasonably foreseeable, of the Contractor: (a) the operation and effect of the rules, regulations, or order promulgated by any commission, county, municipality, or governmental agency of the State of Florida or United States, (b) a restraining order, injunction, or similar decree on any court of competent jurisdiction, (c) war, (d) flood, (e) earthquake, (f) fire, (g) severe wind storm, (h) acts of public disturbance, (i) quarantine restrictions, (j) epidemics, (k) strikes, (l) freight embargoes, or (m) sabotage. The times specified herein for performances include delays that can ordinarily be anticipated due to adverse weather conditions. The County is not obligated to grant an extension of time due to the adverse weather condition unless such conditions rise to the level of Force Majeure.

Delay: Contractor shall not be compensated for delays caused by Contractor's inefficiency, rework made necessary by Contractor's work error, failure to perform the Work as scheduled, or any other corrective or productivity measures made necessary by errors, omissions, or failures to properly perform the Work. Neither shall the Contractor be compensated for delays caused by events by force majeure as described in sub-para (a) above. Within five (5) days after the onset of a delay, Contractor shall notify the County in writing of the delay which shall provide: (1) a detailed description the delay and its probable duration, (2) the specified portion of the Work affected, and (3) an opinion as to the cause of the delay and liability (if any) for the delay. Notice provided more than five (5) days after the inception of the delay shall only be effective as to additional time incurred during the five (5) day period preceding receipt of such notice. In the case of continuing cause delay for the same cause, only one notice of delay is necessary. **Failure to provide this notice waives any claim for extension of time resulting from such delay**. If the delay is due to the failure of another County contractor to complete its work in a timely manner, changes ordered in the Work, a Force Majeure event, or any other cause which the County, in its sole judgment and discretion, determines to justify the delay, then the Completion Date may be extended as necessary to compensate for the delay. All time extensions shall be in the form of a written amendment signed by both parties.

32) CONTRACTOR SAFETY AND HEALTH REQUIREMENTS

The Contractor shall be responsible for supervising all safety precautions, including initiating and maintaining such programs in connection with the performance of the Contract and for adequate maintenance of traffic.

The Contractor shall designate a member of the on-site construction team whose duty shall be the prevention of accidents. Unless notified otherwise in writing by the Contractor to the County and the Engineer, this person shall be the Contractor's Superintendent.

A. <u>OSHA Requirements</u>:

The Contractor warrants that the product, products, or services supplied to St. Johns County shall conform in all respects to the standards set forth in the Occupational Safety and Health Act (OSHA) of 1970 as amended and the failure to comply will be considered a breach of contract. St. Johns County shall be held harmless against any unsafe conditions and contractor employee incidents.

B. <u>Compliance with Occupational Safety and Health Act</u>:

Contractor certifies that all material, equipment, services, etc., furnished in this IFB meets all OSHA requirements for the applicable Sectors. Bidder further certifies that, if he is the successful bidder, and the

material, equipment, service, etc., delivered or provided is subsequently found to be deficient in any OSHA requirement in effect on date of delivery or service fulfillment date, all costs necessary to bring the material, equipment, service, etc., into compliance with the aforementioned requirements shall be borne by the bidder. All Personal Protective Equipment used by the contractor and their employees shall be ANSI certified and meet OSHA standards.

C. Training and Education:

Contractors will ensure that Contractor employees are trained appropriately for their work tasking. The minimum requirements are found in Federal and State Regulations. Examples of this training are (but not limited to):

- Lockout Tagout
- Fall Protection
- Electrical Safety and the National Electrical Code (NEC)
- Confined Space Entry
- Welding/Cutting/Brazing
- Specific Chemical Hazards
- Excavations and Trenching
- Heavy Equipment Operation

Special emphasis should be given towards training and compliance with the Construction industry's "Focus Four" established by OSHA as an outreach program to the construction industry and its workers. Training, education, and awareness should be provided in the areas of: 1) Fall Hazards, 2) Caught-In and Between Hazards, 3) Struck-By Hazards, and 4) Electrocution Hazards.

D. Toxic Substances/Federal Hazard Communication "Right To Know and Understand" Regulations:

The Federal "Right to Know and Understand" Regulation (also known as the Hazard Communication / Globally Harmonized System of Classification and Labeling of Chemicals (GHS) implemented by OSHA requires employers to inform their employees of any toxic substances to which they may be exposed in the workplace, and to provide training in safe chemical storage, labeling, handling practices and emergency procedures.

Accordingly, the Contractor(s) performing under this contract shall be required to provide two (2) complete sets of Safety Data Sheets (SDS) to each of the departments utilizing the awarded products. This information should be provided at the time when the initial delivery is made, on a department-by-department basis. If performing work on site, it is preferred that each contractor bring their hazardous communication program and SDS in a binder labeled with the contractor's name and identified as a Hazardous Communication/GHS Program. Upon leaving the jobsite and the removal of all hazardous materials, contractors shall take their information with them. The transport, use, and disposal of toxic substances must be conducted in accordance with DEP/EPA regulations.

Upon request, contractors working at St. Johns County facilities or jobsites will be given access to the written Hazardous Communication Program and informed where to locate SDS.

E. Temporary Traffic Control (TTC)/Maintenance of Traffic (MOT)

The Contractor must comply with the Florida Department of Transportation's (DOT) Temporary Traffic Control (TTC) and the Manual on Uniform Traffic Control Devices (MUTCD) in the planning, development, design, implementation, operation, enforcement and inspection of work zone related transportation management and temporary traffic control on streets and highways within the State Highway System right-of-way. Training in the Advanced, Intermediate, and Flagger categories must be completed by the Contractor for their employees when performing right-of-way work while under contract with St. Johns County. Contractor employees must wear a Class II (daytime), Class III (night/limited visibility) high-visibility safety vest or equivalent high-visibility apparel while performing any work that places them in the right-of-way

33) TERMINATION

Failure on the part of the Contractor to comply with any portion of the duties and obligations under the Contract shall be cause for termination. If the Contractor fails to perform any aspect of the responsibilities described herein, St. Johns County shall provide written notification of any and all items on non-compliance. The Contractor shall then have five (5) consecutive calendar days to correct any and all items of non-compliance, or take acceptable corrective action, as determined by the County. If the items of non-compliance are not corrected, or acceptable corrective action has not been taken, as determined by the County, within the five (5) consecutive calendar days, the Contract may be terminated by St. Johns County for cause, upon giving seven (7) consecutive calendar days written notice to the Contractor. In the event the County issues more than one (1) Notice of Non-Compliance or Default during the term of the Contract, the County may terminate the Contract, for cause.

The County may terminate the Contract at any time, without cause, upon thirty (30) days written notice to the Contractor of intention to do so.

If, at any time, the Contract with the awarded Contractor is terminated by the County, whether for cause or for convenience, the County may, at its sole discretion, negotiate with the second lowest, responsible, responsive Bidder, in order to enter into a Contract with that Contractor to complete the required Work for the County, if it serves the best interest of the County to do so.

34) METHOD OF PAYMENT

The Contractor shall invoice the SJC Utility Department, for services satisfactorily performed, at the end of each month. The date of the invoice shall not exceed thirty (30) calendar days from the date of services performed. Under no circumstances shall the invoice be submitted to the County in advance of the performance of services. The County reserves the right to refuse or prorate payment based on unsatisfactory performance of services during any month.

St. Johns County Payment Terms: Net 25 Days per 218.735 (1)(a) Florida Statutes

At a minimum, all invoices shall contain the following basic information:

- Vendor Information (Full Legal Name, Address, Phone, Email Address)
- Date of Invoice, Invoice Number
- SJC Purchase Order Number, Master Contract Number, IFB Number
- Unit Prices / Extended Prices / Total Price of Invoice
- Description of Services Performed

35) TAXES

Project is subject to Federal Excise and Florida Sales Taxes, which must be included in Bidder's proposal.

36) INSURANCE

The Contractor shall not commence work under this Contract until he/she has obtained all insurance required under this section and such insurance has been approved by the County. All insurance policies shall be satisfactory to the County and shall be issued by companies authorized and duly licensed to transact business in the State of Florida. The Contractor shall furnish proof of Insurance to the County prior to the execution of this Contract. Certificates of insurance shall clearly indicate Contractor has obtained insurance of the type, amount, and classification as required by this Contract. Required insurance coverage shall be maintained in force, including coverage for Additional Insureds, until Final Completion of all Work including Warranty Work.

No less than ten (10) days written notice shall be provided to the County prior to cancellation, non-renewal or any material change of required insurance policies. Yearly renewal certificates shall be provided to the County within thirty (30) days of expiration of the current policy.

Certificates shall specifically include the County as Additional Insured for all lines of coverage except Workers' Compensation and Professional Liability. A copy of the endorsement must accompany the certificate. Compliance with the foregoing requirements shall not relieve the Contractor of its liability and obligations under this Contract.

Certificate Holder Address: St. Johns County, a political subdivision of the State of Florida
San Sebastian View
St. Augustine, FL 32084
Attn: Purchasing & Contracts Department

The Contractor shall procure and maintain during the life of the awarded Contract, Commercial General Liability Insurance with minimum limits of $1,000,000 per occurrence, $2,000,000 aggregate, including bodily injury (including wrongful death), property damage, products, personal & advertising injury, and completed operations. This insurance must provide coverage for all Claims that may arise from the services and/or operations completed under this Contract, whether such services or operations are by Contractor or anyone directly or indirectly employed by them. Such insurance(s) shall also be primary and non-contributory with regard to insurance carried by the Additional Insureds.

The Contractor shall procure and maintain during the life of the awarded Contract, Commercial Automobile Liability Insurance with minimum limits of $2,000,000 combined single limit for bodily injury and property damage liability and insuring liability arising out of or in any way related directly or indirectly to the ownership, maintenance or use of any owned, non-owned or rented/hired automobiles.

The Contractor shall procure and maintain during the life of the awarded Contract, adequate Workers' Compensation Insurance in at least such amounts as are required by the law for all of its employees per Florida Statute 440.02.

The required insurance limits identified above may be satisfied by a combination of a primary policy and/or Umbrella or Excess Liability Insurance policy.

Providing and maintaining adequate insurance coverage is a material obligation of Contractor. County has no obligation or duty to advise Contractor of any non-compliance with the insurance requirements contained in this Section. If Contractor fails to obtain and maintain all of the insurance coverages required herein, Contractor shall indemnify and hold harmless the Additional Insureds from and against any and all Claims that would have been covered by such insurance had Contractor complied with its obligations herein.

Awarded Supplier shall procure and maintain Builder's Risk ("all risk") insurance on a replacement cost basis for the construction phase of this project. The amount of coverage shall be equal to the full replacement cost on a completed value basis, including periodic increases or decreases in values through change orders.

The Builder's Risk policy shall identify the County as the sole loss payee. The policy shall name as insured the County, Contractor and its subcontractors of every tier. Each insured shall waive all rights of subrogation against each of the other insured to the extent that the loss is covered by the Builder's Risk Insurance. The Builder's Risk policy shall be primary and any self-insurance maintained by the County is not contributory. The Builder's Risk policy shall not include a co-insurance clause. This coverage shall not be lapsed or cancelled because of partial occupancy by the County prior to Final Completion of the Work.

The Builder's Risk insurance shall:

a. Insure against at least the following perils or causes of loss: fire; lightning; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; flood; collapse; explosion; debris removal including demolition as may be reasonably necessary; and water damage (other than that caused by flood).

b. Cover, as insured property, at least the following: (i) the Work and all appurtenances, materials, supplies, fixtures, machinery, apparatus, equipment and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work including County

furnished or assigned property; (ii) spare parts inventory required within the scope of the Contract; and (iii) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Jobsite, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.

c. Extend to cover damage or loss to insured property (i) while in transit; and (ii) while in temporary storage at the Jobsite or in a storage location outside the Jobsite (but not including property stored at the premises of a manufacturer or supplier).

d. Include (i) performance/start-up and hot testing; (ii) soft costs (e.g. design and engineering fees, code updates, permits, bonds, insurances, and inspection costs); and (iii) costs of funding or financing when a covered risk causes delay in completing the Work.

The Builder's Risk Insurance may have a deductible clause. Contractor shall be responsible for paying any and all deductible costs. Notwithstanding anything to the contrary set forth above, the deductible for coverage of all perils and causes of loss enumerated in the section above shall not exceed $250,000.

County reserves the right to adjust the above minimum insurance requirements or require additional insurance coverages to address other insurable hazards.

37) GOVERNING LAWS & REGULATIONS

The Contractor shall be responsible for being familiar and complying with any and all federal, state, and local laws, ordinances, rules and regulations that, in any manner, affect the work required under this contract. The agreement shall be governed by the laws of the State of Florida and St. Johns County both as to interpretation and performance.

38) EMPLOYMENT ELIGIBILITY AND MANDATORY USE OF E-VERIFY

As a condition precedent to entering into this Agreement, and in accordance with section 448.095, F.S., Contractor and its subcontractors shall register with and use the E-Verify system to verify the work authorization status of all employees hired on or after July 1, 2023.

a. Contractor shall require each of its subcontractors to provide Contractor with an affidavit stating that the subcontractor does not employ, contract with, or subcontract with an unauthorized alien. Contractor shall maintain a copy of such affidavit for the duration of this Agreement.

b. The County, Contractor, or any subcontractor who has a good faith belief that a person or entity with which it is contracting has knowingly violated section 448.09(1), F.S. or these provisions regarding employment eligibility shall terminate the contract with the person or entity.

c. The County, upon good faith belief that a subcontractor knowingly violated these provisions regarding employment eligibility, but Contractor otherwise complied, shall promptly notify Contractor and Contractor shall immediately terminate the contract with the subcontractor.

d. Contractor acknowledges that, in the event that the County terminates this Contract for Contractor's breach of these provisions regarding employment eligibility, then Contractor may not be awarded a public contract for at least one (1) year after such termination. Contractor further acknowledges that Contractor is liable for any additional costs incurred by the County as a result of the County's termination of this Agreement for breach of these provisions regarding employment eligibility.

39) EQUAL EMPLOYMENT OPPORTUNITY

In accordance with Federal, State and Local law, the submitting firm shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, or handicap. The submitting Bidder shall be required to comply with all aspects of the American's Disabilities Act (ADA) during the performance

of the work.

40) PROHIBITION AGAINST CONSIDERATION OF SOCIAL, POLITICAL, OR IDEOLOGICAL INTERESTS

Bidders are hereby notified of the provisions of Section 287.05701, Florida Statutes, as amended, that the County will not request documentation of or consider a Bidder's social, political, or ideological interests when determining if the Bidder is a responsible Bidder. Bidders are further notified that the County's governing body shall not give preference to a Bidder based on the Bidder's social, political, or ideological interests.

41) COMPLIANCE WITH FLORIDA STATUTE 287.138

A. Pursuant to 287.138 F.S., effective July 1, 2023, the County may not enter into contracts which grants the Contractor access to personal identifiable information if: 1) the Contractor is owned by the government of a Foreign Country of Concern (as defined by the statute: (b) the government of a Foreign Country of Concern has a controlling interest in the entity; or (c) the Contractor is organized under the law of or has its principal place of business in a Foreign Country of Concern. The County shall be entitled to immediately terminate this Agreement with liability to ensure the County's continued compliance with the statute.

B. Pursuant to 287.138 F.S., effective January 1, 2024, if Contractor may access, receive, transmit, or maintain personal identifiable information under this Agreement, Contractor must submit a Foreign Entity Affidavit to the County. Additionally, effective July 1, 2025, Contractor shall submit a Foreign Entity Affidavit to the County prior to any renewals of this Agreement. Failure or refusal to submit a Foreign Entity Affidavit shall be cause for immediate termination of this Agreement by the County.

42) DISCRIMINATORY VENDORS

In accordance with Section 287.134, Florida Statutes, an entity or affiliate who has been placed on the discriminatory vendor list may not submit a bid on a contract to provide any goods or services to a public entity, may not submit a bid on a contract with a public entity for the construction or repair of a public building or public work, may not submit bids on leases of real property to a public entity, may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity, and may not transact business with any public entity.

43) SCRUTINIZED COMPANIES LIST

Section 287.135 of the Florida Statutes prohibits state agencies and local governments from contracting with companies that are on the Scrutinized Companies Lists. This includes companies on the Scrutinized Companies with Activities in Sudan List and the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List. The prohibition applies to contracts for goods or services valued at more than $1,000,000.

44) PUBLIC RECORDS

A. The cost of reproduction, access to, disclosure, non-disclosure, or exemption of records, data, documents, and/or materials, associated with this Agreement shall be subject to the applicable provisions of the Florida Public Records Law (Chapter 119, Florida Statutes), and other applicable State and Federal provisions. Access to such public records, may not be blocked, thwarted, and/or hindered by placing the public records in the possession of a third party, or an unaffiliated party.

B. In accordance with Florida law, to the extent that Contractor's performance under this Contract constitutes an act on behalf of the County, Contractor shall comply with all requirements of Florida's public records law. Specifically, if Contractor is expressly authorized, and acts on behalf of the County under this Agreement, Contractor shall:

(1) Keep and maintain public records that ordinarily and necessarily would be required by the County in order to perform the Services;

(2) Upon request from the County's custodian of public records, provide the County with a copy of the requested records or allow the records to be inspected or copied within a reasonable time at a cost that

does not exceed the cost as provided in Chapter 119, Florida Statutes, or as otherwise provided by law;

(3) Ensure that public records related to this Agreement that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by applicable law for the duration of this Agreement and following completion of this Agreement if the Contractor does not transfer the records to the County; and

(4) Upon completion of this Agreement, transfer, at no cost, to the County all public records in possession of the Contractor or keep and maintain public records required by the County to perform the Services.

If the Contractor transfers all public records to the County upon completion of this Agreement, the Contractor shall destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure requirements. If the Contractor keeps and maintains public records upon completion of this Agreement, the Contractor shall meet all applicable requirements for retaining public records. All records stored electronically must be provided to the County, upon request from the County's custodian of public records, in a format that is compatible with the County's information technology systems.

Failure by the Contractor to comply with the requirements of this section shall be grounds for immediate, unilateral termination of this Agreement by the County.

IF THE CONTRACTOR HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO ITS DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS AGREEMENT, CONTACT THE CUSTODIAN OF PUBLIC RECORDS AT: 500 San Sebastian View, St. Augustine, FL 32084, (904) 209-0805, publicrecords@sjcfl.us

END OF SECTION

OFFICIAL COUNTY BID FORM
WITH ATTACHMENTS

IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

OFFICIAL COUNTY BID FORM
ST. JOHNS COUNTY, FLORIDA

PROJECT: NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

TO: THE BOARD OF COUNTY COMMISSIONERS OF ST. JOHNS COUNTY, FLORIDA

DATE SUBMITTED: _____

BID PROPOSAL OF

_____

Full Legal Company Name

_____

Mailing Address Telephone Number Email

Bidders: Having become familiar with requirements of the project, and having carefully examined the IFB Documents and Specifications entitled for I**FB No: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS** in St. Johns County, Florida, the undersigned proposes to furnish all materials, labor and equipment, supervision and all other requirements necessary to comply with the Contract Documents to submit the following Bid Proposal summarized as follows:

LUMP SUM BASE BID PRICE: All cost for all labor, materials, equipment, supplies, taxes, other miscellaneous costs, profit, and overhead, both direct and indirect, for completion of all Work except for those Bid Items herein listed separately.

$_____

Lump Sum Base Bid Price (Written in Numerals)

$ _____/Dollars

Lump Sum Base Bid Price (Written in Words)

BID ALTERNATE #01 TOTAL LUMP SUM BID: All costs for all labor, materials, equipment, supplies, taxes, other miscellaneous costs, profit, and overhead, both direct and indirect, for completion of the following work identified in Exhibit A:

1. New degasifier (aeration) system and blower, equipment pad, associated valves and piping.
2. Pumps from new aeration system to existing GST's.
3. Odor control system and associated valves and piping.
4. Demolition of the existing aeration system and clear well.

$_____

Bid Alternate #01 Total Lump Sum Bid (Written in Numerals)

$_____

Bid Alternate #01 Total Lump Sum Bid (Written in Words)

IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

During the preparation of the Bid, the following addenda, if any, were received:

No.: _____ Date Received: _____ No: _____ Date Received: _____

No.: _____ Date Received: _____ No.: _____ Date Received: _____

No.: _____ Date Received: _____ No: _____ Date Received: _____

We, the undersigned, hereby declare that no person or persons, firm or corporation, other than the undersigned are interested, in this proposal, as principals, and that this proposal is made without collusion with any person, firm or corporation, and we have carefully and to our satisfaction examined the IFB Documents and Project Specifications.

We have made a full examination of the location of the proposed work and the sources of supply of materials, and we hereby agree to furnish all necessary labor, equipment and materials, fully understanding that any quantities shown therewith are approximate only, and that we will fully complete all requirements therein as prepared by the County, within the same time limit specified in the IFB Documents as indicated above.

If the Undersigned is notified of the acceptance of this Bid Proposal by the Board within ninety (90) calendar days for the time set for the opening of Bids, the Undersigned further agrees, to execute a contract for the above work within ten (10) days after notice that his Bid has been accepted for the above stated compensation in the form of a Contract presented by the County.

The Undersigned further agrees that security in the form of a Bid Bond, certified or cashier's check in the amount of not less than **five percent (5%) Total Project Bid Price**, payable to the County, accompanies this Bid; that the amount is not to be construed as a penalty, but as liquidated damages which said County will sustain by failure of the Undersigned to execute and deliver the Contract and Bond within ten (10) days of the written notification of the Award of the Contract to him; thereupon, the security shall become the property of the County, but if this Bid is not accepted within ninety (90) days of the time set for the submission of Bids, or if the Undersigned delivers the executed Contract upon receipt, the Security shall be returned to the Bidder within seven (7) working days.

IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

CORPORATE/COMPANY

Full Legal Company Name:_____(Seal)

By:_____ _____
Signature of Authorized Representative (Name & Title typed or printed)

By:_____ _____
Signature of Authorized Representative (Name & Title typed or printed)

Address:_____

Telephone No.: (___)_____ Fax No.: (___)_____

Email Address for Authorized Company Representative: _____

Federal I.D. Tax Number:_____ DUNS #: _____
(If applicable)

INDIVIDUAL

Name: _____
(Signature) (Name typed or printed) (Title)

Address:_____

Telephone No.: (___)_____ Fax No.: _____

Email Address: _____

Federal I.D. Tax Number: _____

Point of Contact (POC) to receive invitation from PaymentWorks for registration to set up a PaymentWorks account <u>OR</u> Point of Contact (POC) who is currently connected to Company's existing PaymentWorks account:

Authorized POC: _____ Email Address for POC:_____
(Name typed or printed)

Each Bidder must submit all required forms and attachments. Failure to submit any required document may be grounds for disqualification due to non-responsiveness.

Submittal Requirements: Official County Bid Form, and all Attachments must be completed and submitted with each copy of the Bid Proposal.

IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

ATTACHMENT "A"
ST. JOHNS COUNTY AFFIDAVIT

Bidder shall complete and submit a sworn statement as part of the submitted Bid. This sworn statement shall be an Affidavit in the following form, executed by an officer/principal of the Bidder, and shall be sworn to before a person who is authorized by law to administer oaths.

STATE OF _____

COUNTY OF _____

The Undersigned authority,_____ ("Affiant"), who being duly sworn, deposes and states that he/she is the _____ (Title) of the Bidder _____ (Full Legal Name of Bidder) submitting the attached Bid for the services provided in the IFB Documents for **IFB No: 2995; North Beach Water Treatment Plant Improvements**, in St. Johns County, Florida.

The Affiant further states that no more than one Bid for the above-referenced project will be submitted from the Bidder, the Affiant, their firm or corporation under the same or different name, and that such Bidder has no financial interest in the firm of another Bidder for the same work. Affiant also states that neither he/she, the firm, association nor corporation of the Bidder has either directly or indirectly entered into any agreement, participated in any collusion, nor otherwise taken any action in restraint of free competitive bidding in connection with this firm's Bid on the above-described project. Furthermore, neither the firm nor any of its officers are barred from participating in public contract lettings in the State of Florida or any other state.

DATED this _____ day of _____, 20____.

_____
Signature of Affiant

_____
Printed Name of Affiant

_____
Printed Title of Affiant

_____
Full Legal Name of Consultant/Contractor

Sworn to (or affirmed) and subscribed before me by means of ☐ physical presence or ☐ online notarization, this _____ day of _____, 20____, by Affiant, who is personally known to me or has produced_____ as identification.

_____
Notary Public
My Commission Expires:_____

IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

ATTACHMENT "B"
CERTIFICATES AS TO CORPORATE PRINCIPAL

I, _____, certify that I am the Secretary of the corporation named as Principal in the foregoing; that _____, (Authorized Representative of Bidder) who signed the Bond(s) on behalf of the Bidder, was then _____ (Title) of said corporation; that I know his/her signature; and his/her signature thereto is genuine; and that said bond(s) was duly signed, sealed, and attested to on behalf of said corporation by authority of its governing body.

_____
Signature of Secretary

_____
Full Legal Name of Corporation (Bidder)

STATE OF _____

COUNTY OF _____

Before and by me, a Notary Public duly commissioned, qualified and acting personally, being duly sworn upon oath by means of ☐ physical presence or ☐ online notarization, _____ (Authorized Representative of Bidder) states that he/she is authorized to execute the foregoing Bid Bond on behalf of the Bidder named therein in favor of St. Johns County, Florida.

Subscribed and sworn to me on this ____ day of _____, 20__, by the Authorized Representative of Bidder, who is personally known to me or has produced _____ as identification. Type and Number of I.D. produced: _____.

_____
Notary Public
My Commission Expires:_____

(Attach Power of Attorney to original Bid Bond and Financial Statement of Surety Company)

IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

ATTACHMENT "C"
LICENSE / CERTIFICATION LIST

In the space below, the Bidder shall list all **current** licenses and certifications held.

The bidder shall attach a copy of each current license, certifications listed below to this form.

The bidder must also attach a list of any and all relevant experience within the last five (5) years with the proposed scope of work.

License(s)/Certificate(s)/ Pre-Qualifications	License #	Issuing Agency	Expiration Date
State of Florida Business License			
SJC Local Business Tax Receipt or Local Jurisdiction in the State of Florida where the Bidder's permanent business location.			
FL Certified General Contractor (CGC)			
FL Certified Building Manufacturer (MB)			
FL Certified Erector (ME)			

IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

ATTACHMENT "D"
LIST OF PROPOSED SUB-CONTRACTORS / SUPPLIERS

Bidder shall submit any and all sub-contractors and/or major material suppliers proposed to perform any portion of the Work for review/approval by the County. Bidder shall attach any and all applicable licenses or certifications held by the proposed sub-contractor/supplier related to the portion of the Work for which they are proposed, as stated below. All subcontractors/suppliers are subject to the approval of the County.

Company Name	Work/Services to be Performed	Primary Contact Name	Contact Number and Email Address

IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

ATTACHMENT "E"
CONFLICT OF INTEREST DISCLOSURE FORM

Project (IFB) Number/Description: **IFB No 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS**

The term "conflict of interest" refers to situations in which financial or other considerations may adversely affect, or have the appearance of adversely affecting a Contractor's professional judgment in completing work for the benefit of St. Johns County ("County"). The bias such conflicts could conceivably impart may inappropriately affect the goals, processes, methods of analysis or outcomes desired by the County.

Contractors are expected to safeguard their ability to make objective, fair, and impartial decisions when performing work for the benefit of the County. Contractors, therefore must there avoid situations in which financial or other considerations may adversely affect, or have the appearance of adversely affecting the Contractor's professional judgement when completing work for the benefit of the County.

The mere appearance of a conflict may be as serious and potentially damaging as an actual distortion of goals, processes, methods of analysis or outcomes. Reports of conflicts based upon appearances can undermine public trust in ways that may not be adequately restored even when the mitigating facts of a situation are brought to light. Apparent conflicts, therefore, should be disclosed and evaluated with the same vigor as actual conflicts.

It is expressly understood that failure to disclose conflicts of interest as described herein may result in immediate disqualification from evaluation or immediate termination from work for the County.

Please check the appropriate statement:

☐ I hereby attest that the undersigned Bidder has no actual or potential conflict of interest due to any other clients, contracts, or property interests for completing work on the above referenced project.

☐ The undersigned Bidder, by attachment to this form, submits information which may be a potential conflict of interest due to other clients, contracts or property interests for completing work on the above referenced project.

Full Legal Name of Bidder: _____

Authorized Representative(s): _____ _____
Signature Print Name/Title

_____ _____
Signature Print Name/Title

IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

ATTACHMENT "F"
DRUG-FREE WORKPLACE FORM

The undersigned firm, in accordance with Florida Statute 287.087 hereby certifies that

_____ does:
Full Legal Name of Bidder

1. Publish a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession or use of a controlled substance is prohibited in the workplace and specifying the actions that will be taken against employees for violations of such prohibition.

2. Inform employees about the danger of drug abuse in the workplace, the business' policy of maintaining a drug-free workplace, any available drug counseling, rehabilitation, employee assistance programs and the penalties that may be imposed upon employees for drug abuse violations.

3. Give each employee engaged in providing the contractual services that are described in St. Johns County's request for proposals a copy of the statement specified in paragraph 1.

4. In the statement specified in paragraph 1, notify the employees that, as a condition of working on the contractual services described in paragraph 3, the employee will abide by the terms of the statement and will notify the employer of any conviction of, or plea of guilty or nolo contendere to, any violation of Florida Statute 893, as amended, or of any controlled substance law of the United States or any state, for a violation occurring in the workplace no later than five (5) days after such conviction or plea.

5. Impose a sanction on, or require the satisfactory participation in a drug abuse assistance or rehabilitation program if such is available in the employee's community by, any employee who is so convicted.

6. Consistent with applicable provisions with State or Federal law, rule, or regulation, make a good faith effort to continue to maintain a drug-free workplace through implementation of paragraphs 1 through 5.

As the person authorized to sign this statement, I certify that this firm complies fully with the above requirements.

_____
Signature of Bidder's Authorized Representative

_____
Date

IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

ATTACHMENT "G"
CLAIMS, LIENS, LITIGATION HISTORY

Bidders must complete all questions below and provide information requested as applicable. Failure to appropriately complete the questions below or provide requested information may be grounds for disqualification. Any material misrepresentation of information may also be grounds for disqualification.

1. Within the past 7 years, has your organization filed suit or a formal claim against a project owner (as a prime or subcontractor) or been sued by or had a formal claim filed by an owner, subcontractor or supplier resulting from a contract dispute? Yes ___ No _____ If yes, please attach additional sheet(s) to include:
   Description of every action Captions of the Litigation or Arbitration

   Amount at issue: _____ Name (s) of the attorneys representing all parties:
   _____
   _____
   _____

   Amount actually recovered, if any: _____

   Name(s) of the contract owner(s)/manager(s) to include address and phone number:
   _____
   _____
   _____

2. List all <u>pending</u> litigation and or arbitration.
   _____
   _____
   _____

3. List and explain <u>all litigation and arbitration</u> within the past seven (7) years - pending, resolved, dismissed, etc.
   _____
   _____
   _____

4. Within the past 7 years, please list all <u>Liens</u>, including Federal, State and Local, which have been filed against your Company. List in detail the type of Lien, date, amount and current status of each Lien.
   _____
   _____
   _____

5. Have you ever abandoned a contract, been terminated, or had an agency submit a claim on a performance/surety bond to take over a contract?

   Yes _____ No _____ If yes, please explain in detail:
   _____
   _____
   _____

6. For all claims filed against your company within the past five (5) years, have all been resolved satisfactorily with final judgment in favor of your company within 90 days of the date the judgment became final? Yes ____ No____ If no, please explain why?

_____

_____

_____

7. List the status of all pending claims currently filed against your company:

_____

_____

_____

Liquidated Damages

1. Has an Agency ever withheld retainage, issued liquidated damages or made a claim against any Performance and Payment Bonds? Yes _____ No _____ If yes, please explain in detail:

_____

_____

_____

(Use additional or supplemental pages as needed)

IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

ATTACHMENT "H"

SWORN STATEMENT UNDER SECTION 287.133(3)(A), FLORIDA STATUTES ON PUBLIC ENTITY CRIMES

I, _____ ("Affiant"), being duly authorized by and on behalf of _____ _____ ("Bidder") hereby swears or affirms as follows:

1. The principal business address of Bidder is: _____ _____

2. I am duly authorized as _____ (Title) of Bidder.

3. I understand that a public entity crime as defined in Section 287.133 of the Florida Statutes includes a violation of any state or federal law by a person with respect to and directly related to the transaction of business with any public entity in Florida or with an agency or political subdivision of any other state or with the United States, including, but not limited to, any bid, proposal, reply, or contract for goods or services, any lease for real property, or any contract for the construction or repair of a public building or public work, involving antitrust, fraud, theft, bribery, collusion, racketeering, conspiracy, or material misrepresentation.

4. I understand that "convicted" or "conviction" is defined in Section 287.133 of the Florida Statutes to mean a finding of guilt or a conviction of a public entity crime, with or without an adjudication of guilt, in any federal or state trial court of record relating to charges brought by indictment or information after July 1, 1989, as a result of a jury verdict, non-jury trial, or entry of a plea of guilt or nolo contendere.

5. I understand that "affiliate" is defined in Section 287.133 of the Florida Statutes to mean (1) a predecessor or successor of a person or a corporation convicted of a public entity crime, or (2) an entity under the control of any natural person who is active in the management of the entity and who has been convicted of a public entity crime, or (3) those officers, directors, executives, partners, shareholders, employees, members, and agents who are active in the management of an affiliate, or (4) a person or corporation who knowingly enters into a joint venture with a person who has been convicted of a public entity crime in Florida during the preceding 36 months.

6. Neither the Bidder, nor any officer, director, executive, partner, shareholder, employee, member or agent who is active in the management of the Offeror or contractor, nor any affiliate of the Offeror or contractor has been convicted of a public entity crime subsequent to July 1, 1989. **(Draw a line through paragraph 6 if paragraph 7 below applies.)**

7. There has been a conviction of a public entity crime by the Respondent, or an officer, director, executive, partner, shareholder, employee, member or agent of the Bidder who is active in the management of the Bidder or an affiliate of the Bidder. A determination has been made pursuant to Section 287.133(3) by order of the Division of Administrative Hearings that it is not in the public interest for the name of the convicted person or affiliate to appear on the convicted vendor list. The name of the convicted person or affiliate is _____. A copy of the order of the Division of Administrative Hearings is attached to this statement. **(Draw a line through paragraph 7 if paragraph 6 above applies.)**

_____ _____

Signature of Affiant | Printed Name & Title of Affiant

_____ _____

Full Legal Name of Bidder | Date of Signature

Sworn to (or affirmed) and subscribed before me by means of ☐ physical presence or ☐ online notarization, this _____ day of _____, 20__, by Affiant, who is ☐ personally known to me or ☐ has produced _____ _____ as identification.

_____ _____

Notary Public | My Commission Expires

ATTACHMENT "I"
NON-COLLUSION CERTIFICATION

St. Johns County requires, as a matter of policy, that any Firm receiving a contract or award resulting from the Invitation for Bid issued by St. Johns County shall make certification as below. Receipt of such certification, under oath, shall be a prerequisite to the award of contract and payment thereof.

I (we) hereby certify that if the contract is awarded to me, our firm, partnership or corporation, that no members of the elected governing body of St. Johns County nor any professional management, administrative official or employee of the County, nor members of his or her immediate family including spouse, parents or children, nor any person representing or purporting to represent any member or members of the elected governing body or other official, has solicited, has received or has been promised, directly or indirectly, any financial benefit including but not limited to a fee, commission, finder's fee, political contribution, goods or services in return for favorable review of any Bids submitted in response to the Invitation for Bid or in return for execution of a contract for performance or provision of services for which Bids are herein sought.

Handwritten Signature of Authorized Principal(s) of Bidder:

NAME (print): _____

SIGNATURE: _____

TITLE: _____

DATE: _____

FULL LEGAL NAME OF PROVIDER:

_____

_____

_____

ATTACHMENT "J"
E-VERIFY AFFIDAVIT

STATE OF _____
COUNTY OF _____

I, _____ (hereinafter "Affiant"), being duly authorized by and on behalf of _____(hereinafter "Contractor") hereby swears or affirms as follows:

1. Contractor understands that E-Verify, authorized by Illegal Immigration Reform and Immigrant Responsibility Act of 1996 (IIRIRA), is a web-based system provided by the United States Department of Homeland Security, through which employers electronically confirm the employment eligibility of their employees.

2. For the duration of Contract No. _____ (hereinafter "Agreement"), in accordance with section 448.095, F.S., Contractor shall utilize the U.S. Department of Homeland Security's E-Verify system to verify the employment eligibility of all new employees hired by the Contractor and shall expressly require any subcontractors performing work or providing services pursuant to the Agreement to likewise utilize the U.S. Department of Homeland Security's E-Verify system to verify the employment eligibility of all new employees hired by the subcontractor.

3. Contractor shall comply with all applicable provisions of section 448.095, F.S., and will incorporate in all subcontracts the obligation to comply with section 448.095, F.S.

4. Contractor understands and agrees that its failure to comply with all applicable provisions of section 448.095, F.S. or its failure to ensure that all employees and subcontractors performing work under the Agreement are legally authorized to work in the United States and the State of Florida constitute a breach of the Agreement for which St. Johns County may immediately terminate the Agreement without notice and without penalty. The Contractor further understands and agrees that in the event of such termination, Contractor shall be liable to the St. Johns County for any costs incurred by the St. Johns County resulting from Contractor's breach.

DATED this _____ day of _____, 20____.

_____
Signature of Affiant

_____
Printed Name of Affiant

_____
Printed Title of Affiant

_____
Full Legal Name of Consultant/Contractor

Sworn to (or affirmed) and subscribed before me by means of ☐ physical presence or ☐ online notarization, this _____ day of _____, 20____, by Affiant, who is personally known to me or has produced_____ as identification.

_____
Notary Public
My Commission Expires:_____

ATTACHMENT "K"
EQUAL OPPORTUNITY REPORT STATEMENT

The Bidder shall complete the following statement by signing this form where indicated. Failure to complete this form may be grounds for rejection of bid:

The awarded Contractor shall comply with Title VI of the Civil Rights Act of 1964, the Civil Rights Restoration Act of 1987 and the Florida Civil Rights Act of 1992, as amended) prohibiting employment discrimination and shall comply with the regulations and guidelines promulgated pursuant to this Act by the Secretary of the Interior and the Heritage Conservation and Recreation Service.

During the performance of this contract, the awarded Contractor, for itself, its assignees and successors in interest (hereinafter referred to as the "Contractor") agrees as follows:

(1) The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

(2) The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive considerations for employment without regard to race, color, religion, sex, or national origin.

(3) The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the Contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(5) The Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary

of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(6) In the event of the Contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions as may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(7) The Contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each sub-Contractor or vendor. The Contractor will take such

action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: Provided, however, That in the event a Contractor becomes involved in, or is threatened with, litigation with a sub-Contractor or vendor as a result of such direction by the administering agency the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

Handwritten Signature of Authorized Principal(s) of Bidder:

NAME (print): _____

SIGNATURE: _____

TITLE: _____

FULL LEGAL NAME OF BIDDER: _____

DATE: _____

IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

ATTACHMENT "L"

Affidavit Regarding the Use of Coercion for Labor and Services

Section 787.06(13), Florida Statutes requires all nongovernmental entities executing, renewing, or extending a contract with a governmental entity to provide an affidavit signed by an officer or representative of the nongovernmental entity under penalty of perjury that the nongovernmental entity does not use coercion for labor or services as defined in that statute.

As an officer or authorized representative of Bidder, I certify that the company identified below does not, for labor or services:

- Use or threaten to use physical force against any person;
- Restrain, isolate, or confine or threaten to restrain, isolate, or confine any person without lawful authority and against her or his will;
- Use lending or other credit methods to establish a debt by any person when labor or services are pledged as a security for the debt, if the value of the labor or services as reasonably assessed is not applied toward the liquidation of the debt, the length and nature of the labor or services are not respectively limited and defined;
- Destroy, conceal, remove, confiscate, withhold, or possess any actual or purported passport, visa, or other immigration document, or any other actual or purported government identification document, of any person;
- Cause or threaten to cause financial harm to any person;
- Entice or lure any person by fraud or deceit; or
- Provide a controlled substance as outlined in Schedule I or Schedule II of s. 893.03 to any person for the purpose of exploitation of that person.

Under penalties of perjury, I declare and affirm that I have read the foregoing document and that the facts stated in it are true and correct.

DATED this _____ day of _____, 20____.

_____
Signature of Affiant

_____
Printed Name of Affiant

_____
Printed Title of Affiant

_____
Full Legal Name of Bidder

Sworn to (or affirmed) and subscribed before me by means of ☐ physical presence or ☐ online notarization, this _____ day of _____, 20____, by Affiant, who is personally known to me or has produced_____ as identification.

_____
Notary Public
My Commission Expires:_____

ATTACHMENT "M"
SCRUTINIZED COMPANIES LIST

Section 287.135, Florida Statutes, prohibits agencies from contracting with companies, for products or services over $1,000,000, that are on either the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List. Both lists are created pursuant to section 215.473, Florida Statutes.

As the person authorized to sign on behalf of Bidder, I hereby certify that the company identified below is not listed on either the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List. I understand that pursuant to section 287.135, Florida Statutes, the submission of a false certification may subject the company to civil penalties, attorney's fees, and/or costs.

Handwritten Signature of Authorized Principal(s):

NAME (print): _____

SIGNATURE: _____

TITLE: _____

NAME OF FIRM: _____

DATE: _____

IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

ATTACHMENT "N"
CERTIFICATE OF COMPLIANCE WITH FLORIDA TRENCH SAFETY ACT

Bidder acknowledges that he is solely responsible for complying with the Florida Trench Safety Act (ACT) and Occupational Safety and Health Administrations excavation safety standard 29 CFR 1926.650 (Subpart P as amended) and the St. Johns County Trenching and Excavation Safety Program. If there is a conflict between the ACT and the St. Johns County Trenching and Excavation Safety Program, the more stringent requirement would apply. Bidder further acknowledges that included in the various items of the proposal and in the Total Bid Price are costs for complying with the Florida Trench Safety Act (90-96, Laws of Florida) effective October 1, 1990 and the Occupational Safety and Health Administrations excavation safety standard.

Handwritten Signature of Authorized Principal(s) of Bidder:

NAME (print): _____

SIGNATURE: _____

TITLE: _____

DATE: _____

NAME OF FIRM/PARTNERSHIP/CORPORATION:

_____

_____

_____

IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

ATTACHMENT "O"
ACKNOWLEDGEMENT OF ADDENDA

Bidder hereby acknowledges receipt of the following Addenda, issued by the County and incorporated into and made a part of the IFB Documents. By acknowledging the Addenda listed below, Bidder hereby certifies that the information, clarifications, revisions, or other items included in each Addenda have been incorporated into the Bidder's Bid. Failure to acknowledge and incorporate issued Addenda may result in a Bidder being deemed non-responsive to the requirements of the IFB, and removed from further consideration.

ADDENDUM NUMBER	DATE RECEIVED	PRINT NAME OF BIDDER'S AUTHORIZED REPRESENTATIVE	TITLE OF BIDDER'S AUTHORIZED REPRESENTATIVE	SIGNATURE OF BIDDER'S AUTHORIZED REPRESENTATIVE

IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

BID BOND

STATE OF FLORIDA
COUNTY OF ST. JOHNS

K N O W A L L M E N B Y T H E S E P R E S E N T S , t h a t _____as Principal, and _____as Surety, are held and firmly bound unto St. Johns County, Florida, in the penal sum of _____ _____Dollars ($_____) lawful money of the United States, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATIONS IS SUCH that whereas the Principal has submitted the accompanying Bid, dated , 20___.

For
NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS
St. Johns County, Florida

NOW THEREFORE,

(a) If the Principal shall not withdraw said Bid within ninety (90) days after Bid Award date, and shall within ten (10) days after prescribed forms are presented to him for signature, enter into a written Contract with the County in accordance with the Bid as accepted, and give Bond with good and sufficient Surety or Sureties, as may be required, for the faithful performance and proper fulfillment of such Contract, then the above obligations shall be void and of no effect, otherwise to remain in full force and virtue.

(b) In the event of the withdrawal of said Bid within the period specified, or the failure to enter into such Contract and give such Bond within the time specified, if the Principal shall pay the County the difference between the amount specified, in said Bid and the amount for which the County may procure the required Work and supplies, if the latter amount be in excess of the former, then the above obligations shall be void and of no effect, otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above bounded parties have executed this instrument under their several seals, this day of _____ A.D., 20___, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

WITNESSES:

(If Sole Ownership or Partnership two (2) Witnesses required).
(If Corporation, Secretary only will attest and affix seal).

WITNESSES:

_____

_____

_____

_____

PRINCIPAL:

NAME OF FIRM:

SIGNATURE OF AUTHORIZED OFFICER (AFFIX SEAL)

TITLE

BUSINESS ADDRESS

CITY STATE

WITNESS:

_____

SURETY:

CORPORATE SURETY

ATTORNEY-IN-FACT (AFFIX SEAL)

BUSINESS ADDRESS

CITY STATE

NAME OF LOCAL INSURANCE AGENCY

SEALED BID MAILING LABEL

Cut along the outer border and affix this label to your sealed bid envelope to identify it as a "Sealed BID"

SEALED BID • DO NOT OPEN



SEALED BID NO.:	**IFB NO: 2995**
IFB TITLE:	**NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS**
DUE DATE/TIME:	**By 2:00PM EDT – August 12, 2026**
SUBMITTED BY:	
	Company Name
	Company Address
	Company Address
DELIVER TO:	St. Johns County Purchasing & Contracts Department 4040 Lewis Speedway St. Augustine FL 32084

END OF DOCUMENT

SJCUD

ST. AUGUSTINE, FLORIDA

PROJECT MANUAL

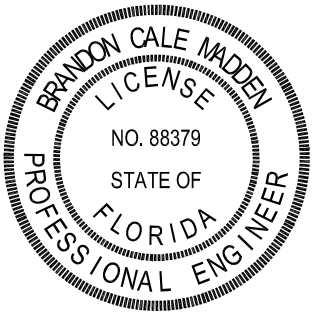
FOR

NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

JUNE 2026

CONFORMED JUNE 2026

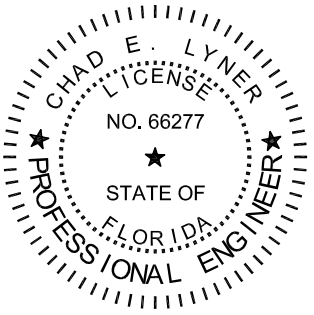
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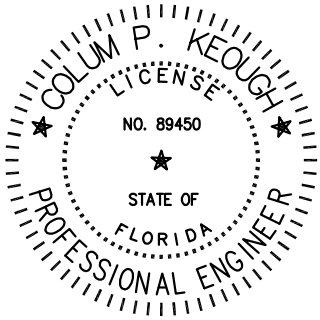
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DIVISION 10 AND 15

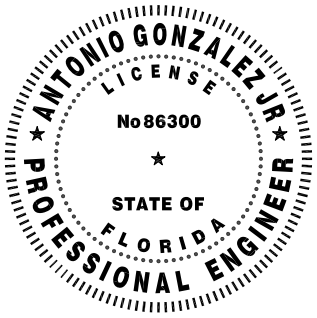
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DIVISION 16

SJCUD PN: 4488-56302-XXXX-56302

MM PN: 502101130-015

Technical Specifications

for

SJCUD NORTH BEACH WTP IMPROVEMENTS

SJCUD Project No.:
Mott MacDonald Project No. 502101130-015

June 2026

MOTT MACDONALD

4600 Touchton Road
Building 200, Suite 250
Jacksonville, FL 32246
Tel: (904) 203-1090
EB-0000155

NORTH BEACH WTP
TECHNICAL SPECIFICATIONS

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ATTACHMENT “B” – CERTIFICATE AS TO CORPORATE PRINCIPAL
ATTACHMENT “C” – LICENSE/CERTIFICATION LIST
ATTACHMENT “D” – LIST OF PROPOSED SUB-CONTRACTORS/SUPPLIERS
ATTACHMENT “E” – CONFLICT OF INTEREST DISCLOSURE FORM
ATTACHMENT “F” – CLAIMS, LIENS, LITIGATION HISTORY
ATTACHMENT “G” – CONTRACTOR’S QUALIFICATIONS FORM
ATTACHMENT “H” – DRUG-FREE WORKPLACE FORM
ATTACHMENT “I” – PROOF OF INSURANCE
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01310 CONSTRUCTION SCHEDULING
01370 SCHEDULE OF VALUES & SCHEDULE OF ASSETS
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01465 EQUIPMENT TESTING AND STARTUP
01500 TEMPORARY FACILITIES
01501 CONTROL OF WORK
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01700 CONTRACT CLOSEOUT
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01720 PROJECT RECORD DOCUMENTS
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APPENDICES

APPENDIX A – GEOTECHNICAL REPORT
APPENDIX B – PERMITS

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SECTION 01010

SUMMARY OF WORK

PART 1- GENERAL

1.01 LOCATION OF WORK

A. The work for this Contract by St. Johns County Utility Department (SJCUD) facility, North Beach Water Treatment Plant (WTP) is located at 415 Nineteenth Street in St. Augustine, Florida. All work shall be completed on these properties.

1.02 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals required to access site and construct a new treatment building to include new RO feed pumps, RO skids, high service pumps, clean-in-place tank and pump, anti-scalant tank and skid, electrical room and gear, air conditioning, restroom and storage. In addition to the building, the project will include demolition of the existing treatment building and existing rectangular storage tank, new transformer and pad, generator, new plant control system and integration to SCADA, relocation of sodium hypochlorite tank and skid, site grading and drainage, and yard piping modifications as shown on the Drawings and as specified herein.
   1. It should be noted that SJCUD is constructing a new Ground Storage Tank No. 2 that will have stub out connections outside of the tank for inlet and outlet. It shall be the contractors responsibility to connect the new tank to the existing system.
   2. A geotechnical investigation and report is attached in **Appendix A**.

B. The following scope of work will be defined as the base bid for this contract and shall include but is not necessarily limited to the following:
   1. Mobilization/demobilization, general requirements, bonds, and insurance
   2. Site work
      a. Clearing, grubbing, filling, grading, seeding, and sodding
      b. Sedimentation and erosion control measures
      c. Asphalt and concrete paving and concrete pads for new equipment
   3. Yard piping including valves and connections:
      a. Connection to existing raw well piping and extend to the new feed pumps at the new treatment building
      b. Connection to existing permeate piping from new building for aeration treatment
      c. New influent and effluent connections to the new GST No. 2
      d. New effluent piping from the GSTs to the new treatment building
      e. New manifold piping from the new HSPs to the system
      f. Modifications to piping for the offsite well pump
      g. Sanitary sewer connection with grinder pump station to existing FM
   4. New pre-engineered metal building including doors, overhead rolling doors, down spouts, gutters, lightning protection, and HVAC system. The building will include an awning to cover the proposed high service pumps, feed pumps and associated valves and piping. The interior building will include the following components:
      a. Two new RO skids, clean-in-place tank system, and anti-scalant system,
      b. New electrical room and equipment,

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c. Bathroom with ancillary equipment,
d. And Storage room

5. Demolition of the existing treatment building (to the extents shown on the Drawings) and rectangular storage tank.
6. Canopy on remaining treatment building pad to house the offsite well pump, new generator, and sodium hypochlorite tank and skid.
7. New FPL service transformer, equipment pad, and service metering as required by FPL. Contractor to coordinate requirements with OWNER and FPL.
8. Electrical Components
   a. MCC, ATS, low voltage panels, transformers, VFDs, and disconnect switches.
   b. Process Control system including instrumentation, control panels, SCADA panel and integration.
   c. Generator, generator control panel, and generator load center.
9. All instrumentation and electrical components including conduit, wires, motors, cabling, level instruments, level floats, gauges, flow meters, and other field instruments for a fully functioning system
10. All PLC programming shall be completed by McKim & Creed.
11. Exterior lighting
12. All performance and materials testing required during construction
13. All permits necessary to complete the work

C. The following scope of work will be defined as the 'Bid Alternate' for this project.
   1. New degasifier (aeration) system and blower, equipment pad, associated valves and piping,
   2. Pumps from new aeration system to existing GSTs,
   3. Odor control system and associated valves and piping,
   4. Demolition of the existing aeration system and clear well

1.03 PERMITS AND REGULATIONS

A. The CONTRACTOR'S responsibility includes compliance with federal, state, and local regulations which in any way affect the work or implementation of the Project.
   1. Copies of permits are attached in **Appendix B.**

1.04 WORK BY OTHERS

A. It is anticipated that work will occur or recently be completed by others during the construction of this Work. Installation of ground storage tank No. 2 and relocation of the RO concentrate effluent line. This work will occur at other locations within the plant as the proposed improvements. CONTRACTOR shall coordinate with the OWNER and other CONTRACTORS for construction access.

1.05 WORK DESCRIPTION AND SEQUENCE

A. Perform work in a sequence to ensure completion of the Work in the Contract Time. Completion dates of the various stages shall be in accordance with the approved construction schedule submitted by the CONTRACTOR.

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B. The CONTRACTOR shall submit a written schedule to the OWNER and ENGINEER for approval prior to commencing work.

C. Specific schedule constraints shall be outlined in Section 01014 Construction Sequence.

D. Substantial Completion and Final Completion: The project will include two separate major milestones including:
   1. Substantial completion: Requires a five-day consecutive 24-hour day period of successful operation of the North Beach WTP system as per Section 01465 as well as all on-site work including punch list times required by the CONTRACT shall have been completed to where the CONTRACTOR can vacate the site and only the elements of a submittal and closeout nature remain for the attainment of Final Completion and as previously described
   2. Final completion: The last stage of construction shall be final construction and shall include the final remaining items subject to ENGINEER'S approval as well as all items listed in Section 01700, Contract Closeout. A total of 30 days has been allotted for final completion after substantial completion.

1.06 CONTRACTORS USE OF PREMISES

A. CONTRACTOR shall have complete use of the premises for the performance of the Work. CONTRACTOR shall coordinate activities with any other CONTRACTOR who will be performing work in the same general area.

B. CONTRACTOR shall limit the use of the premises for his/her Work and for storage to allow for:
   1. OWNER occupancy
   2. Work by other contractors

C. Coordinate uses of premises with OWNER and other CONTRACTORS.

D. CONTRACTOR shall assume full responsibility for security of all his/her and his/her subcontractor's materials and equipment stored on the site.

E. If directed by the OWNER or ENGINEER, move any stored items which interfere with operations of OWNER or other contractors.

F. Obtain and pay for use of additional storage or work areas if needed to perform the Work.

1.07 CONTRACTOR'S STAGING, STORAGE, AND STOCKPILE AREA

A. Limited areas on the site are available for the CONTRACTOR's staging, storage, stockpile, and trailer areas. The available areas for the staging, storage, and trailers area at the project site will be agreed upon by the CONTRACTOR and OWNER at the start of construction. The CONTRACTOR shall limit their storage area to where construction will occur and shall not use other areas in the plant for storage without approval of the ENGINEER and OWNER.

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1.08 SECURITY

A. The CONTRACTOR shall ensure that each employee, representative, Supplier, and others acting for the CONTRACTOR use designated staging areas and parking areas.

B. The CONTRACTOR shall employ watchmen on the work when necessary and shall erect and maintain strong and suitable barriers and lights as necessary to prevent the happening of any accident to a person, to the property, to the work, and to any materials stored onsite.

C. The CONTRACTOR shall employ any additional temporary fencing and gates to adequately protect the work and shall provide all access required by the ENGINEER and the OWNER.

D. Stored materials shall be kept in a neat and orderly manner. Materials that are subject to deteriorations by exposure to the sun, rain, or other elements shall be kept adequately covered and protected. Refer to Section 01600 for additional details.

E. The CONTRACTOR shall be responsible for protecting all stored materials and the project site safe from theft and vandalism. The CONTRACTOR shall employ security personnel and erect additional fences as necessary at no additional cost to the OWNER.

1.09 OWNER OCCUPANCY

A. Owner will occupy premises during performance of the work to conduct his/her normal operations. CONTRACTOR shall coordinate all construction operations with ENGINEER to minimize conflict and to facilitate OWNER usage.

1.010 BASIS OF DESIGN AND MODIFICATIONS FOR ALTERNATE EQUIPMENT

A. Drawings indicate the extent and general arrangement of the Work. If any departures from the Drawings are deemed necessary by the CONTRACTOR to accommodate the materials and equipment he proposes to furnish, details of such departures and reasons therefore shall be submitted. No such departures shall be made without the prior written approval of the ENGINEER and OWNER. Approved changes shall be made without additional cost to the OWNER.

B. The specific equipment proposed for use by the CONTRACTOR on the project may require changes to structures, auxiliary equipment, piping, electrical, mechanical, controls, or other work to provide a completely satisfactory operating installation. The CONTRACTOR shall submit to the ENGINEER for approval all necessary Drawings and details showing such changes to verify conformance with the overall project structural and architectural requirements and overall project operating performance. The lump sum bid price shall include all costs in connection with the preparation of new drawings and details and all changes in construction work to accommodate the proposed equipment, including increase in the costs.

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C. In the event that the ENGINEER is required to provide additional engineering services as a result of substitution of materials or equipment, which are not listed as “or equal”, or changes by the CONTRACTOR in dimension, weight, power requirements, etc. of the equipment accessories furnished, or if the ENGINEER is required to examine and evaluate any changes proposed by the CONTRACTOR for the convenience of the CONTRACTOR, then the ENGINEER’S charges in connection with such additional services shall be charged to the CONTRACTOR by the OWNER.

END OF SECTION 01010

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SECTION 01014

CONSTRUCTION SEQUENCE

PART 1- GENERAL

1.01 GENERAL REQUIREMENTS

A. This project consists of work on property owned by St. Johns County at the existing North Beach Water Treatment Plant (WTP) at 415 Nineteenth Street in St. Augustine, Florida. The improvements to the WTP will involve construction of a new treatment building, demolition of an existing storage tank and existing treatment building, modifications to onsite piping and relocation of equipment within the confines of the existing plant site while maintaining operation of the existing plant until such time as the new treatment building is operational. All coordination of phasing and sequencing of construction shall be approved by the OWNER and ENGINEER and shall be confirmed in writing by the OWNER in order to be valid.

B. It is anticipated that work will occur or recently be completed by others during the construction of this Work. Installation of ground storage tank No. 2 and relocation of the RO concentrate effluent line. This work will occur at other locations within the plant as the proposed improvements.

C. This project in particular requires detailed construction sequencing and scheduling. Notification requirements and submittals required herein and as described in other technical specifications will be required and shall be coordinated in the overall schedule. The construction progress schedules required under Section 01310 shall reflect the conditions presented in this section. The phasing and sequencing below is provided as a recommendation of construction however it is ultimately to up to the Contractor to provide a sequencing plan that meets the project timelines. The following details the overall process:
   1. The newly constructed GST No. 2 will include stub out locations that will require connection to the plant. Upon completion of the GST No. 2 connection and verification that the tank is fully operational, the Contractor may proceed to the next phase.
   2. The existing rectangular tank currently discharges to the High Service Pump (HSP) manifold through two 6-inch effluent lines. The Contractor shall field-verify the location of both lines and confirm the isolation valves on the HSP manifold prior to closure. Once the valves are closed, the parallel valve to the manifold shall be opened to allow GST Nos. 1 and 2 to supply all HSPs.
   3. After isolating the effluent lines from the rectangular tank, demolition of the rectangular tank may commence. All piping located beneath the existing tank shall be removed.
   4. All underground piping, communication and electrical conduits beneath the footprint of the new treatment building shall be installed prior to building erection. New RO skids systems, feed pumps, anti-scalant system, HSPs, VFDs, electrical distribution equipment and associated piping and valves shall be installed inside and outside of building. The proposed bathroom and building drain lines will connect to the sanitary sewer line to discharge to the existing grinder pump station. Contractor shall confirm location of isolation valves for tie-in.
   5. Distribution header shall be installed as well as magnetic flow meter pad and equipment.

6. The new FPL service transformer, electric service meter, AT&T internet service, MCC and plant control panel can be installed concurrently after the building is erected. The existing overhead FPL Service shall remain active until the plant operations are switched over to the new treatment building.
7. The RO influent line will require a temporary shutdown, which must be coordinated with SJCUD operations. As the plant will bypass raw well water to the existing aerators during this shutdown, this window shall be utilized to perform the cut-in connection rather than a wet tap. The existing RO concentrate line will additionally be cut into to connect the newly installed RO concentrate line within the plant site for discharge.
8. Similarly, the new feed pump connections will utilize a cut-in connection and bypass will occur to the existing aerators during this time. Shutdown and tie-in to the new treatment building shall be coordinated with SJCUD operations.
9. Once feed piping, permeate piping, and concentrate lines are installed, tested and operational, the newly installed RO skids may be verified and tested to be placed into service.
10. The installation of the relocated HSP and VFDs can occur once the building is operational.
11. Once all connections are complete for a fully operational plant, the contractor can demolish the existing treatment building to the extents shown on the Drawings.
12. Relocation of the sodium hypochlorite tank and skid will be placed within the existing building slab under a new canopy and reconnected to the same injection point with new tubing.
13. Generator will be installed on existing building pad within canopy and connected.
14. Offsite well pump will be relocated to existing building pad under canopy and rerouted to pump manifold.

D. The following sequencing is for the ‘Bid Alternates’ Work. In the event that the bid alternatives are included in the base bid, phasing and sequencing below is provided as a recommendation of construction however it is ultimately to up to the contractor to provide a sequencing plan that meets the project timelines The following descriptive details the overall process:
   1. The contractor shall install a temporary bypass line from the existing aerator effluent line and connect downstream of the clear well discharge line. A temporary pump will be required during the clear well operations in order to pump water into GST No. 1 and 2.
   2. The clear well and pump can be demolished.
   3. The new degasifier, odor control system and GST feed pumps will be installed between the new treatment building and GSTs and will connect to the treated water line that was installed in the base bid. New degasifier and odor control system installation shall be erected with blower, piping, and two new effluent pumps prior to connection to the existing treated water line.
   4. The aerated water will then connect into the existing fill line connections for the GSTs.
   5. The odor control system will be connected to the degasifier. Connections to the degasifier shall be coordinated with the manufacturer’s locations.
   6. Once the influent and effluent lines are connected into the new degasifier, the flow can be switched.
   7. Sodium hypochlorite injection point to be installed into GST feed lines.

8. After all connections to the existing aerators are removed, demolition will be completed. Contractor shall use caution while demolishing aerators as they are nearby the onsite well and manifold lines.

E. Modifications that affect or may affect the operation of the existing facility shall not be made without written permission from the OWNER.

F. Notification requirements and submittals required herein and as described in other technical specifications will be required and shall be coordinated in the overall schedule. The construction progress schedules required as per Section 01310 shall properly reflect the constraints and sequencing outlined herein.
1. Startups, tie-ins, and training shall not occur on Fridays.
2. A minimum of 14 business days' notice shall be provided to both the OWNER and ENGINEER for all pre-startup checkouts, startup of any system, and tie-ins (piping, electrical, or instrumentation in nature).
3. Startup plans by equipment as well as a system wide startup plan shall be received at least 30 days prior to the day anticipated for review and approval by the OWNER and ENGINEER.

G. See Sections 01465 and 01730 for additional requirements and Division 11 through 16 on specific equipment startup and testing requirements.

H. Special precautions are necessary to ensure that no damage occurs to these facilities including piping, utilities, roads, and structures in general that are to remain in operation and are not to be modified or replaced. Any temporary facilities, materials, equipment, and labor required to ensure that no damage occurs shall be provided by the CONTRACTOR as part of the Work and at no additional cost to the OWNER.

I. The OWNER reserves the right to postpone connections to existing utilities due to operational and/or weather-related concerns.

J. This sequence of construction should be used in coordination with the demolition plans and existing yard piping and utilities to determine final sequencing events by the CONTRACTOR to complete the work.

1.02 DEFINITIONS AND TERMS

A. Construction Scheduling Constraints: Constraints for performance of the Work, required because of special sequencing with other parts of the Work, calendar time constraints and special testing, commissioning and procedures are identified in this Section. These constraints are in addition to the standard procedures such as maintaining working drawings, testing, commissioning, training, etc. These constraints shall be included in the CONTRACTOR's progress schedule.

B. Special Conditions: Certain special conditions related to performance of the Work are identified in this Section and shall be included in the CONTRACTOR's progress schedule.

1.03 NOTIFICATION REQUIREMENTS

A. The CONTRACTOR shall give a minimum of 14 working days advance written notice to the OWNER of each component proposed for shutdown, tie-in, or disruption, all of which shall be subject to OWNER's approval and limitations. Shutdowns, tie-ins, or disruptions specifically mentioned in the Section must conform to this requirement and any others requested by the OWNER.

B. In general, no work which affects or could affect the plant operations shall be performed without a specific plan written by the CONTRACTOR approved in advance by the OWNER.

1.04 SUBMITTAL REQUIREMENTS

A. CONTRACTOR shall submit shop drawings and working drawings in accordance with Section 01300 to show details, describe timelines for said work, and description of working plan of all construction sequencing including any temporary services, bypasses, shutdowns, tie-ins, and connections to existing systems.

B. The CONTRACTOR shall submit a proposed construction sequence within a month of receiving the NTP.

1.05 SITE CONDITIONS

A. Several areas of construction under this contract must be coordinated with the station's operating personnel and accomplished in a logical order to maintain the influent flow through the plant and to allow construction to be completed within the time allowed by the Contract Documents. The CONTRACTOR shall coordinate the activities to allow for orderly and timely completion of all the work.

B. When access through construction areas must be disrupted, the CONTRACTOR shall provide alternate acceptable access for the plant's operators.

C. The CONTRACTOR shall coordinate the activities in the interface or common areas with the plant operators. The CONTRACTOR shall submit to the ENGINEER and the OWNER a description and schedule as to how the common areas will be utilized, recognizing the required coordination with the plant operators. Access to existing plant must be provided to the plant operators at all times.

D. Various components of construction will involve work in close proximity to existing structures and piping. The CONTRACTOR shall coordinate with the plant operators prior to starting any such work that has the potential to disrupt service and discuss back-up plans. Furthermore, the CONTRACTOR shall provide any corrective measure or temporary facilities necessary to perform the work at no additional cost to the OWNER and without interrupting the plant operation. Where temporary shoring is required in order to allow new construction to proceed while protecting adjacent existing plant structures still in operation, the CONTRACTOR shall engage the services of a company to design and install engineered systems signed and sealed by a Florida PE.

E. Where potable water or plant water is required in large quantity for preoperational testing or other use, the CONTRACTOR shall provide all necessary facilities and

pay all costs associated with delivering water from the point of supply to the point of use. The OWNER will provide the water free of charge.

F. During all start-up and performance testing activities, the CONTRACTOR shall make available the manpower, equipment, and manufacturer's representatives required to make any necessary adjustments and training.

G. The CONTRACTOR shall conduct their operations so as to cause the least possible interference and/or inconvenience with the normal operations of the facility. Dust-tight partitions or other methods approved by the ENGINEER to contain dust, debris, rain, etc., from construction areas shall be provided. Protective covers for equipment, furnishings, and water filled basins shall be provided by the CONTRACTOR in areas of work within existing buildings and structures.

1.06 FIELD OFFICE

A. The CONTRACTOR shall provide field office trailer(s) for themselves. The field office(s) shall be set up and fully equipped and all utilities connected within 30 days from the construction Notice to Proceed. The office(s) shall be removed not earlier than the date of substantial completion and not later than the date of final payment. The CONTRACTOR shall be responsible for all work and/or coordination associated with connection to all utilities. Refer to Section 01500 for additional details.

B. The location of the field offices and additional storage and lay down areas shall be reflected on the CONTRACTOR's site utilization plan to be provided for review by the OWNER prior to mobilization. After substantial completion, but prior to final completion, the field offices shall be removed, and the CONTRACTOR shall restore disturbed area to match existing conditions.

1.07 CONSTRUCTION CONSTRAINTS

A. The CONTRACTOR shall meet the constraints below and shall consider these constraints when developing the overall plan of construction. The list is not intended to release the CONTRACTOR from the responsibility to coordinate Work in any manner which will ensure project completion within the time allowed. The following areas are not necessarily listed in their required sequence of construction but represents a sequence that has been reviewed with the OWNER and appears both practical and able to maintain safe operation of the influent pump station. Other proposed sequences will be considered but will be subject to final approval by the OWNER and ENGINEER. Any such plan will initially be approved if the plan clearly demonstrates its execution can be accomplished without affecting flow to the plant; there will be no allowance for any plant shutdowns.

B. Sitework
   1. Erosion control and temporary fencing of all construction areas shall be performed within 30 days after the Notice to Proceed. All erosion control devices and storm drainage piping and inlets affected by construction shall be installed prior to any excavation in those areas.

2. All underground pipes, conduits, cables, duct banks, and structures installation work shall be organized and scheduled to accomplish the following:
   a. The OWNER access to operating facilities shall be maintained at all times.
   b. If possible, underground work in each area shall be performed concurrently to avoid subsequent trenching through the same areas.
   c. Yard electrical work and piping work shall be shown on the same working drawings and fully coordinated horizontally and vertically.
   d. Existing systems shall remain fully operational except for pre-planned, scheduled, and organized outages.
3. New bituminous and concrete pavement and sidewalk replacement shall not be installed until all piping, cables, conduits, and duct banks under the paved area have been installed. Roads shall be stabilized with crushed stone until that time. Any weak areas in base course or existing pavement shall be removed and replaced prior to the final surface course installation. This work will occur prior to substantial completion.
4. Locations and numbers of sedimentation control facilities shall be adjusted as the work progresses so that all site runoff flows through sedimentation control facilities at all times. At no time shall undesilted water be allowed to leave the site. Maintenance and upgrading of facilities shall be scheduled weekly and after all rain events.
5. Dewatering activities which discharge to the storm sewers shall be properly protected and desilted and permitted. It is anticipated that dewatering activities will be required on the site for various activities and construction of the Work. Refer to the geotechnical report in **Appendix A** as well as Section 02140 for additional details. Claims or delays related to the ineffectiveness, length or duration of dewatering, or extent of required dewatering activities will not be considered.
   a. The CONTRACTOR shall submit a Notice of Intent to Use Noticed General Permit for Short Term Construction Dewatering to the St. Johns River Water Management District prior to starting any dewatering activity at the project site. Please note there will be dewatering required to complete construction of the new structures and/or site piping.

C. Electrical
1. The existing FPL overhead electrical service must be upgraded following the construction of the new treatment building. The existing FPL Service shall remain active until the plant operations are switched over to the new treatment building.
2. The existing AT&T internet service shall be replaced with a new underground service concurrently with the installation of the new underground FPL electrical service.
3. All existing ductbanks, instrumentation, and controls and conduits shall remain in full service during construction. There shall be no demolition work or shutdowns of the electrical system without approval by the ENGINEER and OWNER. The CONTRACTOR shall plan in advance for work and the modifications required to the existing electrical system in accordance with Division 16.

4. CONTRACTOR shall coordinate the location of any new conduits and hand dig as necessary to avoid disruption of other existing utilities. Detailed locations of new underground electrical shall be coordinated by the CONTRACTOR and included in the CONTRACTOR's yard piping working drawings which also show other existing utilities, conduits, ductbanks, and yard structures.

D. Instrumentation and I&C
   1. Perform field operational tests including all SCADA and automatic functions prior to facilities startup. This shall be implemented and demonstrated to confirm that the plant is ready to begin the 5-day operational test required for substantial completion. Operation in "hand" without all instruments, SCADA, and controls in place is not an acceptable means to dictate startup. All programming and controls shall be performed McKim and Creed.

E. Existing WTP Demolition
   1. The CONTRACTOR shall refer to the design drawings and Section 02050 of the Contract Documents for demolition details and specific requirements.
   2. A detailed schedule indicating duration (hours/days/weeks) of all demolition activities and shop drawing detailing the demolition methods must be provided to the ENGINEER for review and approval prior to beginning the work.
   3. All abandoned underground pipes and electrical shall be removed unless otherwise noted on Drawings.
   4. After the new treatment building is fully operational and has successfully completed the five-day consecutive 24-hour day period of successful operation, the CONTRACTOR can proceed with the demolition work related to the existing building.

F. Access Driveway
   1. The site has multiple access points. The CONTRACTOR shall work with the OWNER to coordinate how the access should be utilized during construction to minimize interference with plant operations.

1.08 PERMITS

A. The CONTRACTOR shall arrange for all required inspections and shall close out the permits at the end of the Contract.

1.09 TESTING

A. All facilities and systems shall be tested as a condition precedent to substantial completion. See Section 01465 and equipment specifications for additional requirements. Start-up plans for the facility and equipment shall be submitted, reviewed, and approved by the ENGINEER and OWNER.

B. All equipment and facilities shall be tested according to respective process component specifications herein and more specifically:
   1. Pre-startup Testing: All components, subsystems, and systems in each process component and associated process component shall be checked

before electrical and process fluids are applied, and these checks shall verify completeness, leakage, electrical, instrumentation connections for correct installation. Equipment suppliers and all trades must certify that the respective systems are ready for operation. The OWNER shall inspect and must agree that each system is ready for energizing and process fluids. The ENGINEER and OWNER shall be present for verification of pre-startup testing. All systems in contact with potable water shall be properly disinfected in accordance with SJCUD and the state of Florida disinfection procedures.

2. Operational Testing: All process systems shall be operated with clean and/or plant water as applicable water to verify that all components, sub-systems, and systems operate correctly and meet individual performance requirements and that electrical, control, and instrumentation systems function satisfactorily. Corrections, adjustments, replacements, calibrations, and training shall take place during this stage. All systems must be functionally complete and 100 percent satisfactory and ready for process start-up and continuous operation at the conclusion of this stage. Details on operational testing requirements are specified in the respective process component specifications. The ENGINEER and OWNER shall be present for verification of operational testing. Final training shall take place during operational testing.
3. Performance Testing: Performance testing shall be conducted after the respective process systems and all associated process systems have been started and are operating continuously and satisfactorily. Demonstration of successful performance testing shall be a condition precedent to final completion. Details on performance testing requirements are included in the respective process component specification and herein. The ENGINEER and OWNER shall be present for verification of performance testing.

C. Final Piping Connections and Pressure Testing
1. Final connections and switchover piping will be required to be tested. The tie-in shall be coordinated with the plant operating staff and scheduled a minimum of 14 days in advance with the OWNER. The CONTRACTOR shall pressure test all piping as required after making connections.

END OF SECTION 01014

SECTION 01050

PROJECT CONTROLS (SURVEYING)

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. Provide and pay for field engineering services required for project, including but not limited to:
   1. Survey work required for project controls and layout and to execute project.
   2. Certified as-built surveys specified herein.
   3. Civil, structural, or other professional engineering services specified or required to execute CONTRACTOR's construction methods.
   4. CONTRACTOR shall note that the elevations shown within the Drawings were obtained using survey with elevation provided in NAVD88 Datum.The CONTRACTOR shall be responsible for field verification of all existing elevations (structure, utilities, etc.) prior to procurement of equipment or materials necessary to perform the work. The CONTRACTOR shall notify the ENGINEER and OWNER of any elevation deviations or discrepancies from the contract documents.

B. Retain the services of a registered land surveyor licensed in the state of Florida to:
   1. Identify existing control points and property line corners indicated on the Drawings.
   2. Verify and record all existing structure locations in the vicinity of, or adjacent to, the proposed Work; and, the locations of all proposed structures and facilities.
   3. Maintain an accurate record of locations of all new buried piping, valves, and duct banks and existing buried piping and other buried existing facilities (piping, conduits, and structures) encountered and/or relocated during construction of the new work.
   4. Maintain accurate locations of all new structures, including corner locations, tank locations, and equipment locations within the project site.

C. All survey work as described herein shall be completed by the registered land surveyor on a MONTHLY basis and provided at each monthly progress meeting.

1.02 RELATED WORK

A. Summary of Work is included in Section 01010.

B. Contract Closeout is included in Section 01700.

C. Record Drawings is included in Section 01720.

1.03 SUBMITTALS

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A. Submit, to the ENGINEER, the name, address and state registration and license number of proposed registered land surveyor.

B. On request of the ENGINEER, submit documentation to verify accuracy of field engineering work.

C. At the end of the project, and prior to final payment, submit certified as-built drawing(s) (with the Surveyor's title block, signed and sealed by registered Land Surveyor) of the items listed throughout this Section. All surveys shall be tied to the applicable grid system and shall indicate all pre-existing and new project benchmarks. Vertical control shall conform to the project elevation datum designated on the plans.
   1. Certified site survey at 1-in = 40-ft scale or larger, but not greater than 1-in = 20-ft scale, on 22-in by 34-in sheet(s) and electronic (PDF) version, indicating the building corners, sidewalks, paved areas and location of all above ground structures within the project site or limits of construction.
   2. Certified survey, drawn to the same scale as the ENGINEER's yard piping drawings, showing the locations, lines and grades in plan and profile views of all below-grade lines (piping and all electrical ducts) exterior to buildings and other buried facilities (e.g., valves, tanks, etc). This requirement includes all utilities installed as a part of the scope of this project, as well as existing lines encountered during the installation of the new Work.
   3. Certified survey showing the location, pipes and grades of all pipes 2 inches in diameter and larger buried and exterior to buildings and other buried facilities (e.g. valves, tanks, vaults, etc.) installed as a result of the work. This shall be at the same scale as the ENGINEER's yard piping drawing.
   4. Certified survey showing elevations of all flow control points, such as weirs, elevations of all new structures and equipment etc. at the water treatment plant.

1.04 QUALIFICATIONS OF SURVEYOR

A. Registered land surveyor, licensed in the state of Florida.

1.05 SURVEY REFERENCE POINTS

A. Existing basic horizontal and vertical control points for the project are those designated on Drawings.

B. Locate and protect control points prior to starting site work and preserve all permanent reference points during construction.
   1. Make no changes or relocations without prior written notice to and approval by the ENGINEER.

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2. Report to the ENGINEER when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
3. Require the surveyor to correctly replace project control points which may be lost or destroyed. Establish replacements based on original survey control.

1.06 PROJECT SURVEY REQUIREMENTS

A. Establish a minimum of two permanent bench marks on site, referenced to data established by survey control points.
   1. Record locations, with horizontal and vertical data, on the as-built survey.
   2. Permanent benchmarks shall be installed and spaced for convenient reference and use at locations along the pipeline route and/or on the plant site.
   3. Benchmarks shall be installed to National Geodetic Survey standards and shall include horizontal and vertical data, as well as the installation date.

B. Establish lines and levels; locate and lay out:
   1. Site improvements.
      a. Stakes for grading, fill and topsoil placement.
      b. Utility slopes and invert elevations.
      c. Sidewalks, pavement, fencing, storm drainage facilities, and other finish surface work.
      d. Locations, sizes, and depths of manholes, valves, and fittings.
   2. Batter boards for structures.
   3. Building foundation, column locations and floor levels.
   4. Controlling lines and levels required for mechanical and electrical trades.
   5. Slabs and floor levels.

C. If lines, levels, or layouts are lost or destroyed, or if required by the OWNER or ENGINEER, verify layouts by same methods.

D. Establish all lines and grades prior to construction of line work for all force mains, transmission mains, storm drainage piping, gravity sewers and other new utility mains at 100-ft increments, at defined breaks in grade, and at manholes.

E. The following dimensional references must be depicted on the as-built drawings.
   1. Depths of various elements of foundation in relation to finish first floor datum.
   2. All underground piping with elevations and dimensions. Changes to piping location. Horizontal and vertical locations of all underground utilities and appurtenances, referenced to permanent surface improvements. Actual

installed pipe material, class, etc. All pipes and valves shall be labeled using the method as per the contract drawings.

3. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.
4. Field changes of dimension and detail.
5. Changes made by field order or by change order.
6. Details not on original contract drawings.
7. Equipment and piping relocations.
8. All underground duct banks with elevations and dimensions, horizontal and vertical locations of underground duct banks, and manholes along duct banks.
9. All underground cable elevations and horizontal locations of underground cables.
10. All existing and new structures clearly indicated.
11. All elevations of new structures (including weirs) clearly indicated.

F. All work will be performed in accordance with the Minimum Technical Standards set forth by the Florida Board of Land Surveyors.

G. As a condition of completing the County permit, after approval, and upon completion of the proposed project, an "As-Built" survey is required. The as-built will show all easements, all on and off-site physical improvements (i.e., paving, buildings, walkways, buffer, fencing, dumpster enclosures accessible routes) and identify street names and shall be in compliance with Part 6.04.00 C of the Land Development Code (LDC) prior to issuance of any Certificates of Occupancy (COs). A copy of these requirements can be obtained from Section 15.0 As-Built in the Development Review Manual whose link is Section 15.0 As Built. St. Johns County Development Review inspector shall be contacted 24 hours prior to all necessary site work inspections and 5 days prior to the final inspection.

PART 2 – PRODUCTS

(NOT USED)

PART 3 – EXECUTION

3.01 RECORDS

A. Maintain a complete, accurate log of all control and survey work as it progresses.

B. Update the project as-built survey on a monthly basis, based on the work performed during the month. Submit one copy of up to date as-built documentation with CONTRACTOR’s monthly applications for payment.

C. Maintain an accurate record of new and existing piping, conduit and structure changes, revisions, relocations, and modifications.

END OF SECTION 01050

SECTION 01110

ENVIRONMENTAL PROTECTION PROCEDURES

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. The work covered by this Section consists of furnishing all labor, materials and equipment and performing all work required for the prevention of environmental pollution in conformance with applicable laws and regulations, during and as the result of construction operations under this Contract. For the purpose of this Section, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic and/or recreational purposes.

B. The control of environmental pollution requires consideration of air, water and land, and involves management of noise and solid waste, as well as other pollutants.

C. CONTRACTOR shall schedule and conduct all work in a manner that will minimize the erosion of soils in the area of the work. CONTRACTOR shall provide erosion control measures such as diversion channels, sedimentation or filtration systems, berms, staked hay bales, seeding, mulching or other special surface treatments as are required to prevent silting and muddying of streams, rivers, impoundments, lakes, etc. All erosion control measures shall be in place in an area prior to any construction activity in that area. Specific requirements for erosion and sedimentation controls are specified in the contract drawings.

D. This Section is intended to ensure that construction is achieved with a minimum of disturbance to the existing ecological balance between a water resource and its surroundings. These are general guidelines. It is the CONTRACTOR's responsibility to determine the specific construction techniques to meet these guidelines.

E. All phases of sedimentation and erosion control shall comply with and be subject to the laws of the State of Florida. CONTRACTOR shall prepare a sedimentation and erosion control drawing meeting the requirements of the law. Furnish two copies of the approved Drawing to the ENGINEER no less than two weeks prior to starting the work.

1.02 APPLICABLE REGULATIONS

A. Comply with all applicable Federal, State and local laws and regulations concerning environmental pollution control and abatement.

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1.03 NOTIFICATIONS

A. The ENGINEER will notify the CONTRACTOR in writing of any non-compliance with the foregoing provisions or of any environmentally objectionable acts and corrective action to be taken. State or local agencies responsible for verification of certain aspects of the environmental protection requirements shall notify the CONTRACTOR in writing, through the ENGINEER, of any non-compliance with State or local requirements. After receipt of such notice from the ENGINEER or from the regulatory agency through the ENGINEER, immediately take corrective action. Such notice, when delivered to the CONTRACTOR or their authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the CONTRACTOR fails or refuses to comply promptly, the ENGINEER or OWNER may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the CONTRACTOR unless it is later determined that the CONTRACTOR was in compliance.

1.04 IMPLEMENTATION

A. Prior to commencement of the work, CONTRACTOR shall meet with the ENGINEER to develop mutual understandings relative to compliance with these provisions and administration of the environmental pollution control program.

B. CONTRACTOR shall remove temporary environmental control features, when approved by the ENGINEER and incorporate permanent control features into the project at the earliest practicable time.

PART 2 – PRODUCTS

(NOT USED)

PART 3 – EXECUTION

3.01 EROSION CONTROL

A. CONTRACTOR shall provide positive means of erosion control such as shallow ditches around construction to carry off surface water. Erosion control measures, such as siltation basins, hay check dams, mulching, jute netting and other equivalent techniques, shall be used as appropriate. Flow of surface water into excavated areas shall be prevented. Ditches around construction area shall also be used to carry away water resulting from dewatering of excavated areas. At the completion of the work, ditches shall be backfilled and the ground surface restored to original condition.

3.02 PROTECTION OF STREAMS AND SURFACE WATERS

A. Care shall be taken to prevent, or reduce to a minimum, any damage to any stream or surface water from pollution by debris, sediment, or other material, or from the manipulation of equipment and/or materials in or near such streams. Water that has been used for washing or processing, or that contains oils or sediments that will reduce the quality of the water in the stream, shall not be directly returned to the stream. Such waters shall be diverted through a settling basin or filter before being directed into streams or surface waters.

B. The CONTRACTOR shall not discharge water from dewatering operations directly into any live or intermittent stream, channel, wetlands, surface water or any storm sewer. Water from dewatering operations shall be treated by filtration, settling basins, or other approved method to reduce the amount of sediment contained in the water to allowable levels.

C. All preventative measures shall be taken to avoid spillage of petroleum products and other pollutants. In the event of any spillage, prompt remedial action shall be taken in accordance with a contingency action plan approved by the Florida Department of Environmental Protection and the US EPA. The CONTRACTOR shall submit two copies of approved contingency plans to the ENGINEER.

D. Water being flushed from structures or pipelines after disinfection, with Cl_2, shall be treated with a dechlorination solution, in a method approved by the ENGINEER, prior to discharge.

3.03 PROTECTION OF LAND RESOURCES

A. Restore land resources within the project boundaries and outside the limits of permanent work shall be restored to a condition, after completion of construction that will appear to be natural and not detract from the appearance of the project. Confine all construction activities to areas shown on the Drawings.

B. Outside of areas requiring earthwork for the construction of the new facilities, the CONTRACTOR shall not deface, injure, or destroy trees or shrubs, nor remove or cut them without prior approval. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorage unless specifically authorized by the ENGINEER. Where such special emergency use is permitted, first wrap the trunk with a sufficient thickness of burlap or rags over which softwood cleats shall be tied before any rope, cable, or wire is placed. The CONTRACTOR shall in any event be responsible for any damage resulting from such use.

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C. Protect trees that may possibly be defaced, bruised, injured, or otherwise damaged by the construction equipment, dumping or other operations, by placing boards, planks, or poles around them. Monuments and markers shall be protected similarly.

D. Any trees or other landscape features scarred or damaged by the CONTRACTOR'S equipment or operations shall be restored as nearly as possible to their original condition. The OWNER will decide the method of restoration to be used and whether damaged trees shall be treated and healed or removed and disposed of.

1. All scars made on trees by equipment, construction operations, or by the removal of limbs larger than 1-inch in diameter shall be coated as soon as possible with an approved tree wound dressing. All trimming or pruning shall be performed in an approved manner by experienced workmen with saws or pruning shears. Tree trimming with axes will not be permitted.
2. Climbing ropes shall be used where necessary for safety. Trees that are to remain, either within or outside established clearing limits, that are subsequently damaged by the CONTRACTOR and are beyond saving in the opinion of the OWNER, shall be immediately removed and replaced.

E. The locations of the CONTRACTOR'S storage and other construction activities, required temporarily in the performance of the work, shall be cleared portions of the job site or areas to be cleared as by the OWNER and ENGINEER and shall not be within wetlands or floodplains. The CONTRACTOR shall submit a layout of the proposed storage areas to the OWNER and ENGINEER for approval at least 10 days prior to scheduled start. The preservation of the landscape shall be an imperative consideration in the selection of all sites and in the construction of buildings. Drawings showing storage facilities shall be submitted for approval of the ENGINEER.

F. If the CONTRACTOR proposes to construct temporary roads or embankments and excavations for plant and/or work areas, he shall submit the following for approval at least ten days prior to scheduled start of such temporary work.

1. A layout of all temporary roads, excavations, embankments and drainage to be constructed within the work area.
2. Details of temporary road construction.
3. Drawings and cross sections of proposed embankments and their foundations, including a description of proposed materials.
4. A landscaping drawing showing the proposed restoration of the area. Indicate the proposed removal of any trees and shrubs outside the limits of existing clearing area. Indicate locations of guard posts or barriers required to control vehicular traffic and protect trees and shrubs to be maintained undamaged. The Drawing shall provide for the obliteration of construction

scars as such and shall provide for a natural appearing final condition of the area. Modification of the CONTRACTOR'S approved drawings shall be made only with the written approval of the ENGINEER. No unauthorized road construction, excavation or embankment construction including disposal areas will be permitted.

G. CONTRACTOR shall remove all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess of waste materials, or any other vestiges of construction as directed by the ENGINEER. It is anticipated that excavation, filling and plowing of roadways will be required to restore the area to near natural conditions which will permit the growth of vegetation thereon. The disturbed areas shall be prepared and seeded as approved by the ENGINEER or OWNER.

H. All debris and excess material will be disposed of outside wetland or floodplain areas in an environmentally sound manner.

3.04 PROTECTION OF AIR QUALITY

A. Burning – The use of burning at the project site for the disposal of refuse and debris will not be permitted unless authorized by the OWNER and a Large Land Clearing Burning Permit is acquired under the State of Florida.

B. Dust Control - Maintain all excavations, embankment, stockpiles, access roads, plant sites, waste areas, borrow areas and all other work areas within or without the project boundaries free from dust which could cause the standards for air pollution to be exceeded and which would cause a hazard or nuisance to others. CONTRACTOR shall control dust resulting from clearing and grubbing operations to prevent nuisance to adjacent property owners and the general public. CONTRACTOR shall use dust control methods and materials approved by the ENGINEER.

C. An approved method of stabilization consisting of sprinkling or other similar methods will be permitted to control dust. The use of petroleum products is prohibited. The use of chlorides may be permitted with approval from the ENGINEER.

D. Sprinkling, to be approved, must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times, and the CONTRACTOR shall have sufficient competent equipment on the job to accomplish this. Dust control shall be performed as the work proceeds and whenever a dust nuisance or hazard occurs, as determined by the OWNER.

3.05 NOISE CONTROL

A. CONTRACTOR shall make every effort to minimize noises caused by the construction operations. Equipment shall be equipped with silencers or mufflers designed to operate with the least possible noise in compliance with Federal and State regulations. CONTRACTOR shall meet the local ordinances regarding noise control.

B. All equipment to be furnished under this Contract, unless specified otherwise in the technical specifications, shall be designed to ensure that the sound pressure level does not exceed 85 decibels over a frequency range of 37.8 to 9600 cycles per second at a distance of 3-ft from any portion of the equipment, under any load condition, when tested using standard equipment and methods. Noise levels shall include the noise from the motor. Mufflers or external baffles shall not be acceptable for the purpose of reducing noise. Data on noise levels shall be included with the shop drawing submittal.

3.06 MAINTENANCE OF POLLUTION CONTROL FACILITIES DURING CONSTRUCTION

A. During the life of this contract, CONTRACTOR shall maintain all facilities constructed for pollution control as long as the operations creating the particular pollutant are being carried out or until the material concerned has become stabilized to the extent that pollution is no longer being created.

3.07 ENVIRONMENTAL AND PUBLIC NUISANCE

A. CONTRACTOR shall not create a public nuisance including but not limited to encroachment on adjacent lands, flooding of adjacent lands, or excessive noise or dust. CONTRACTOR shall eliminate noise to as great an extent as practicable at all times.

END OF SECTION 01110

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SECTION 01200

PROJECT MEETINGS

PART 1- GENERAL

1.01 REQUIREMENTS INCLUDED

A. The ENGINEER shall schedule, administer, and prepare meeting minutes for the pre-construction meeting, periodic progress meetings, and specially called meetings throughout progress of the work.

B. Representatives of CONTRACTOR, SUBCONTRACTORS and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.

C. The CONTRACTOR shall attend meetings to ascertain that work is expedited consistent with Contract Documents and construction schedules.

1.02 RELATED REQUIREMENTS

A. Section 01310: Construction Schedule

B. Section 01720: Project Record Documents

C. Section 01300: Submittals

D. Section 01730: Operating and Maintenance Data

1.03 PRE-CONSTRUCTION MEETING

A. Schedule a pre-construction meeting.

B. Location: A central site, convenient for all parties, designated by the OWNER.

C. Attendance:
1. Owner's representative
2. ENGINEER and his/her professional consultants
3. Resident project representative
4. CONTRACTOR'S superintendent
5. Major SUBCONTRACTORS
6. Major suppliers
7. Others as appropriate.

D. Suggested Agenda:
1. Distribution and discussion of:
    a. List of major SUBCONTRACTORS and suppliers
    b. Projected construction schedules
2. Critical work sequencing
3. Major equipment deliveries and priorities
4. Project coordination
    a. Designation of responsible personnel
    b. Submittals
    c. Applications for payment

5. Procedures and processing of:
    a. Field Decisions
    b. Proposal requests
    c. Submittals
    d. Change orders
    e. Application for payment
6. Adequacy of distribution of Contract Documents
7. Procedures for maintaining Record Documents
8. Use of premises:
    a. Office, work, and storage areas
    b. Owner's requirements
9. Construction facilities, controls and construction aids
10. Temporary utilities
11. Housekeeping procedures

1.04 PROGRESS MEETINGS

A. Schedule regular periodic meetings. A total of 36 progress meetings have been allocated over the entire construction period and will be scheduled by the ENGINEER after the schedule has been reviewed.

B. Hold called meetings as required by progress of the work.

C. Location of the meetings: Project field office of CONTRACTOR or ENGINEER.

D. Attendance shall be similar to pre-construction meeting and as deemed appropriate by the ENGINEER or Owner.

E. Suggested Agenda:
1. Review, approval of minutes of previous meeting
2. Review of work progress since previous meeting
3. Field observations, problems, and/or conflicts
4. Problems which impede construction schedule
5. Review of offsite fabrication, delivery schedules
6. Corrective measures and procedures to regain projected schedule
7. Revisions to construction schedule
8. Progress, schedule, during succeeding work period
9. Coordination of schedules
10. Review submittal schedules; expedite as required
11. Maintenance of quality standards
12. Pending changes and substitutions
13. Review proposed changes for:
    a. Effect on construction schedule and on completion date
    b. Effect on other contracts of the Project
14. Other business
15. Critical/long lead item

F. The CONTRACTOR shall attend progress meetings and is to study previous meeting minutes and current agenda items, in order to be prepared to discuss pertinent topics such as deliveries of materials and equipment, progress of the work, etc.

G. The CONTRACTOR shall provide a summary of work performed since the last meeting and anticipated work to be performed over the next 30 to 45 days at each progress meeting.

H. The CONTRACTOR shall provide an updated schedule at each progress meeting for the remaining work.

END OF SECTION 01200

SECTION 01300

SUBMITTALS

PART 1- GENERAL

1.01 SCOPE OF WORK

A. This Section specifies the general methods and requirements of submissions applicable to Shop Drawings, Product Data, Samples and Operations and Maintenance Manuals. Detailed submittal requirements are specified in the Technical Sections.

B. Submittals are categorized into two types: Action Submittals and Informational Submittals, as follows:
   1. Action Submittals: Written and graphic information submitted by the CONTRACTOR that requires the ENGINEER'S approval. The following are examples of action submittals:
      a. Shop drawings (including working drawings and product data)
      b. Samples
      c. Operation and maintenance manuals
      d. Site usage plan (CONTRACTOR's staging – including trailer siting and material laydown area)
      e. Schedule of values
      f. Payment application format
   2. Informational Submittal: Information submitted by the CONTRACTOR that is required to be reviewed by the ENGINEER prior to work being completed. ENGINEER will provide review comments that may require revisions. Informational submittals will be marked "Reviewed" by the ENGINEER when submittal is considered acceptable. The following are examples of informational submittals:
      a. Shop drawing schedule
      b. Construction schedule
      c. Statements of qualifications
      d. Health and Safety Plans
      e. Construction photography and videography
      f. Work plans
      g. Maintenance of traffic plans
      h. Outage requests
      i. Proposed testing procedures
      j. Test records and reports
      k. Vendor training outlines/plans
      l. Test and start-up reports
      m. Certifications
      n. Record drawings
      o. Record shop drawings
      p. Submittals required by laws, regulations and governing agencies
      q. Submittals required by funding agencies
      r. Other requirements found within the technical specifications
      s. Warranties and bonds
      t. As-Built surveys
      u. Contract close-out documents

C. All submittals shall be delivered directly to the Mott MacDonald office located at: 4600 Touchton Rd, Building 200, Suite 250, Jacksonville, FL 32246.

D. All submittals shall be clearly identified by reference to section number, paragraph, drawing, or detail, as applicable.

E. Submittals shall be clean and legible and of sufficient size for presentation of data.

F. Submittal reviews after the “B” submittal will be back-charged to the CONTRACTOR for the ENGINEER’S time by the OWNER for each additional review. The initial submittal for a Specification Section item by the contractor shall be considered the “A” submittal, with the first subsequent submittal for the same item due to a “A” submittal review status containing “Resubmit” to be considered the “B” submittal. This shall be tracked monthly by the ENGINEER and deducted from each monthly pay application. The OWNER will then reimburse the ENGINEER for these additional services through an amendment.

1.02 RELATED WORK

A. Additional requirements may be specified in the General Conditions for the Contract.

B. Additional submittal requirements may be specified in the respective technical Specification Sections.

C. Project Controls are included in Section 01050.

D. Construction Schedules are included in Section 01310.

E. Project Record Documents are included in Section 01720.

F. Operation and Maintenance manuals are included in Section 01730.

G. Warranties are included in Section 01740.

1.03 CONTRACTOR’S RESPONSIBILITIES

A. All submittals shall be clearly identified as follows:
   1. Date of submission
   2. Project number
   3. Project Name
   4. CONTRACTOR identification
      a. CONTRACTOR
      b. Supplier
      c. Manufacturer
      d. Manufacturer or supplier representative
   5. Identification of the product
   6. Reference to Contract drawing(s)
   7. Reference to specification section number, page and paragraph(s)

8. Reference to applicable standards, such as ASTM or Federal Standards numbers
9. Indication of CONTRACTOR's approval
10. CONTRACTOR's Certification statement
11. Identification of deviations from the Contract Documents, if any
12. Reference to previous submittal (for resubmittals)

B. Submittals shall be clear and legible, and of sufficient size for legibility and clarity of the presented data.

C. Submittal Log

Maintain a log of all submittals. The submittal log shall be kept accurate and up to date. This log should include the following items (as applicable):

1. Description
2. Submittal number
3. Date transmitted to the ENGINEER
4. Date returned to CONTRACTOR (from ENGINEER)
5. Status of Submittal (Approved/Not Approved/etc.)
6. Date of Resubmittal to ENGINEER and Return from ENGINEER (if applicable and repeat as necessary)
7. Date material released for fabrication
8. Projected (or actual) delivery date

D. Numbering System

Utilize a 9-character submittal identification numbering system in the following manner:

1. The first character shall be a D, S, M or I which represents Shop Drawing (including working drawings and product data), Sample, Manual (Operation & Maintenance) or Informational, respectively.
2. The next five digits shall be the applicable Section Number.
3. The next two digits shall be the numbers 01 to 99 to sequentially number each separate item or drawing submitted under each specific Specification Section, in the order submitted.
4. The last character shall be a letter, A to Z, indication the submission (or resubmission) of the same submittal, i.e., "A" = 1st submission, "B" = 2nd submission, "C" = 3rd submission, etc. A typical submittal would be as follows:

   D-03300-008-B

   D = Shop Drawing
   03300 = Section for Concrete
   08 = the eighth different submittal under this section
   B = the second submission (first resubmission) of the particular Shop Drawing

E. Variances

Notify the ENGINEER in writing, at the time of submittal, of any deviations in the submittals from the requirements of the Contract Documents.

F. Action Submittals
   1. Shop Drawings, Working Drawings, Product Data and Samples
      a. Shop drawings as defined in the General Conditions, and as specified in individual Sections include, but are not necessarily limited to, custom prepared data such as fabrication and erection/installation (working) drawings, scheduled information, setting diagrams, actual shop work manufacturing instructions, custom templates, wiring diagrams, coordination drawings, equipment inspection and test reports, including performance curves and certificates, as applicable to the work.
      b. CONTRACTOR shall verify all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data, and coordinate each item with other related shop drawings and the Contract requirements.
      c. All details on shop drawings shall show clearly the relation of the various parts to the main members and lines of the structure and where correct fabrication of the work depends upon field measurements shall be made and noted on the drawings before being submitted.
      d. All shop drawings submitted by subcontractor's and vendors shall be reviewed by the CONTRACTOR for field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data, and that it has been coordinated with other related shop drawings and the Contract requirements. Submittals directly from subcontractor's or vendors will not be accepted by the ENGINEER.
      e. The CONTRACTOR shall be responsible the accuracy of the subcontractor's or vendor's submittal; and, for their submission in a timely manner to support the requirements of the CONTRACTOR's construction schedule. Shop drawings found to be inaccurate or otherwise in error shall be returned to the subcontractor or vendor to correct before submission to the ENGINEER. All shop drawings shall be approved by the CONTRACTOR.
      f. Delays to construction due to the untimely submission of submittals will constitute inexcusable delays, for which CONTRACTOR shall not be eligible for additional cost nor additional contract time. Inexcusable delays consist of any delay within the CONTRACTOR's control.
      g. Submittals for equipment specified under Divisions 02, 03, 11, 13, 14, 15 and 16 shall include a listing of installations where identical or similar equipment manufactured by that manufacturer has been installed and in operation for a period of at least five years.
   2. Working Drawings
      a. Detailed installation drawings (equipment, piping, electrical conduits and controls, HVAC work, and plumbing, etc.) shall be prepared and submitted for review and approval by the ENGINEER prior to installing such work. Installation drawings shall be-to-scale and shall be fully dimensioned.
      b. Piping working drawings shall show the laying dimensions of all pipes, fittings, valves, as well as the equipment to which it is being connected. In addition, all pipe supports shall be shown.
      c. Equipment working drawings shall show all equipment dimensions, anchor bolts, support pads, piping connections and electrical

connections. In addition, show clearances required around such equipment for maintenance of the equipment.

d. Electrical working drawings shall show conduits, junction boxes, disconnects, control devices, lighting fixtures, support details, control panels, lighting and power panels, and Motor Control Centers. Coordinate all locations with the Contract Documents and the CONTRACTOR's other working drawings.

3. Product Data
   a. Product data, as specified individual Specification Sections, include, but are not limited to, the manufacturer's standard prepared data for manufactured products (catalog data), such as the product specifications, installation instructions, availability of colors and patterns, rough-in diagrams and templates, product photographs (or diagrams), wiring diagrams, performance curves, quality control inspection and reports, certifications of compliance (as specified or otherwise required), mill reports, product operating and maintenance instructions, recommended spare parts and product warranties, as applicable.
4. Samples
   a. Furnish, samples required by the Contract Documents for the ENGINEER's approval. Samples shall be delivered to the ENGINEER as specified or directed. Unless specified otherwise, provide at least two samples of each required item. Materials or equipment for which samples are required shall not be used in the work unless and until approved by the ENGINEER.
   b. Samples specified in individual Specification Sections, include, but are not limited to: physical examples of the work (such as sections manufactured or fabricated work), small cuts or containers of materials, complete units of repetitively-used products, color/texture/pattern swatches and range sets, specimens for coordination of visual effect, graphic symbols, and other specified units of work.
   c. Approval of a sample shall be only for the characteristics or use named in such approval and shall not be construed to change or modify and Contact Requirements.
   d. Approved samples not destroyed in testing shall be sent to the ENGINEER or stored at the site of the work. Approved samples of the hardware in good condition will be marked for identification and may be used in the work. Materials and equipment incorporated in work shall match the approved samples. Samples which fail testing or are not approved will be returned to the CONTRACTOR at their expense, if so requested at time of submission.
5. Professional Engineer (P.E.) Certification Form
   a. If specifically required in any of the technical Sections, submit a Professional Engineer (P.E) Certification for each item required, signed and sealed by the P.E. licensed or registered in the state wherein the work is located.
6. CONTRACTOR's Certification
   a. Each shop drawing, working drawings, product data, and sample shall have affixed to it the following Certification Statement: *"Certification Statement: by this submittal, I hereby represent that I have determined*

and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements."

b. Shop drawings, working drawings, and product data sheets 11-in x 17-in and smaller shall be bound together in an orderly fashion and bear above Certification Statement on the cover sheet. The transmittal cover sheet for each identified shop drawing shall fully describe the packaged data and include a listing of all items within the package.

7. The review and approval of shop drawings, working drawings, product data, or samples by the ENGINEER shall not relieve the CONTRACTOR from the responsibility for the fulfilment of the terms of the Contract. All risks of error and omissions are assumed by the CONTRACTOR and the ENGINEER will have no responsibility therefore.
8. Project work, materials, fabrications, and installation shall conform to approved shop drawings (including working drawings and product data) and applicable supplies.
9. No portion of the work requiring a shop drawing (including working drawings and product data) or sample shall be started, nor shall any materials be fabricated or installed before approval of such item. Procurement, fabrication, delivery or installation or products or materials that do not conform to approved shop drawings shall be at the CONTRACTOR's risk. Furthermore, such products or materials delivered or installed without approved shop drawings, or in non-conformance with the approved shop drawings will not be eligible for progress payment until such time as the product or material is approved or brought into compliance with approved shop drawings. Neither the OWNER nor ENGINEER will be liable for any expense or delay due to corrections or remedies required to accomplish conformity.
10. Operation and Maintenance Data
    a. Operation and maintenance data shall be submitted in assembled manuals as specified. Such manuals shall include detailed instructions for OWNER personnel on safe operation procedures, controls, start-up, shut down, emergency procedures, storage, protection, lubrication, testing, trouble shooting, adjustments, repair procedures, and other maintenance requirements.
11. Payment Application Format
    a. If an application form is included in the Contract Documents, use that form unless otherwise approved by the ENGINEER and OWNER. If an application form is not included in the Contract Documents, CONTRACTOR may propose a form for approval.
12. Site Usage
    a. Submit a proposed site staging plan, including but not limited to the location of office trailers, storage trailers and material laydown. Such a plan shall be a graphic presentation (drawing) of the proposed locations; and, shall include on-site traffic modifications, and temporary utilities, as may be applicable.

G. Informational Submittals
   1. Shop Drawing Schedule

a. Prepare and submit a schedule indicating when shop drawings are required to be submitted to support the as-planned construction schedule. The submittal schedule shall allow sufficient time for preparation and submittal, review and approval, and fabrication and delivery to support the construction schedule.

2. Construction Schedule
   a. Prepare and submit construction schedules and monthly status reports as specified.
3. Statements of Qualifications
   a. Provide evidence of qualification, certification, or registration, as required in the Contract Documents, to verify qualifications of licensed land surveyor, professional engineer, materials testing laboratory, specialty subcontractor, technical specialist, consultant, specialty installer, and other professionals.
4. Health and Safety Plans
   a. When specified, prepare and submit a general company Health and Safety Plan (HSP), modified or supplemented to include job-specific considerations.
5. Construction Photography and Videography
   a. Provide periodic construction photographs and videography as specified – including but not limited to preconstruction photographs and/or video, monthly progress photos and/or video and post-construction photographs and/or videos.
6. Work Plans
   a. Prepare and submit copies of all work plans needed to demonstrate to the OWNER that CONTRACTOR has adequately through-out the means and methods of construction and their interface with existing facilities.
   b. A shutdown plan with sequence instructions including timing and personnel required shall be submitted to the OWNER upon request.
7. Maintenance of Traffic Plans
   a. Prepare maintenance of traffic plans where and when required by the Contract Documents and by local ordinances or regulations. If CONTRACTOR is not already knowledgeable about local ordinances and regulations regarding maintenance of traffic requirements, become familiar with such requirements, and include all costs for permits and fees to implement the traffic management plan, in the GMP amount. In addition, unless a supplemental payment provision is provided in the GMP, include the cost of police attendance, when required.
8. Outage Requests
   a. Provide sufficient notification of any outages (electrical, flow processes, etc.) as may be required to tie-in new work into existing facilities. Unless specified otherwise elsewhere, a minimum of seven calendar days' notice shall be provided.
9. Proposed Testing Procedures
   a. Prepare and submit testing procedures it proposes to use to perform testing required by the various technical specifications.
10. Test Records and Reports
    a. Provide copies of all test records and reports as specified in the various technical specifications.

11. Vendor Training Outlines/Plans
    a. At least two weeks before scheduled training of OWNER's personnel, provide lesson plans for vendor training in accordance with the specification for O&M manuals.
12. Test and Start-Up Reports
    a. Manufacturer shall perform all pre-start up installation inspection, calibrations, alignments, and performance testing as specified in the respective Specification Section. Provide copies of all such test and start up reports.
13. Certifications
    a. Provide various certifications as required by the technical specifications. Such certifications shall be signed by an officer (of the Firm) or other individual authorized to sign documents on behalf of that entity.
    b. Certifications may include, but are not limited to:
        1) Welding certifications and welders qualifications.
        2) Certifications of Installation, Testing and Training for all equipment.
        3) Material Testing reports furnished by an independent testing firm.
        4) Certifications from manufacturer(s) for specified factory testing.
        5) Certifications required indicating compliance with any sustainability or LEEDS accreditation requirements indicated in the Contract Documents.
14. Record Drawings
    a. No later than Substantial Completion, submit a record of all changes during construction not already incorporated into drawings in accordance with specification on Project Record Documents.
15. Submittals Required by Laws, Regulations, and Governing Agencies
    a. Prepare and submit all documentation required by state or local law, regulation or government agency directly to the applicable agency. This includes, but is not limited to, notifications, reports, certifications, certified payroll (for projects subject to wage requirements) and other documentation required to satisfy all requirements. Provide to ENGINEER one copy of each submittal made in accordance with this paragraph.
16. Submittals Required by Funding Agencies
    a. Prepare and submit all documentation required by funding agencies. This includes but is not limited to segregated pay applications and change orders when required to properly allocate funds to different funding sources; and certified payrolls for projects subject to wage requirements. Provide one copy of each submittal made in accordance with this paragraph to the ENGINEER.
17. Other Requirements of the Technical Specifications Sections
    a. Comply with all other requirements of the technical specifications.
18. Warranties
    a. Assemble a book(let) of all warranties as specified in the various technical specifications and in accordance with the specification on Warranties and provide to the ENGINEER.
19. As-Built Surveys

a. Engage the serves of a licensed land surveyor in accordance with the Project Controls specification. Prior to Final Completion, provide an As-Built survey of the constructed facility, as specified.

20. Contract Close-Out Documents
    a. Submit Contract documentation as indicated in the specification for Contract Close-out.

PART 2- PRODUCTS (NOT USED)

PART 3- EXECUTION

3.01 SUBMITTAL SCHEDULE

A. Provide an initial submittal schedule at the pre-construction meeting for review by OWNER and ENGINEER. Incorporate comments from OWNER or ENGINEER into a revised submittal schedule.

B. Maintain the submittal schedule and provide sufficient copies for review by OWNER and ENGINEER. An up-to-date submittal schedule shall be provided at each project progress meeting.

3.02 TRANSMITTALS

A. Prepare separate transmittal sheets for each submittal. Each transmittal sheet shall include at least the following: the CONTRACTOR's name and address, OWNER's name, project name, project number, submittal number, description of submittal and number of copies submitted.

B. Submittals shall be transmitted or delivered directly to the office of the ENGINEER, as indicated in the Contract Documents or as otherwise directed by the ENGINEER.

C. Provide copies of transmittals (only, i.e., without copies of the respective submittal) directly to the Resident Project Representative.

3.03 PROCEDURES

A. Action Submittals
    1. CONTRACTOR's Responsibilities
        a. Coordination of Submittal Times: Prepare and transmit each submittal sufficiently in advance of preforming the related work or other applicable activities, or within the time specified in the individual work of other related Sections, so that the installation will not be delayed by processing times including disapproval and resubmittal (if required). Coordinate with other submittals, testing, purchasing, fabrication, delivery and similar sequenced activities. Extensions to the Contract Time will not be approved for the CONTRACTOR's failure to transmit submittals sufficiently in advance of the Work.

b. The submittals of all shop drawings (including working drawings and product data) shall be sufficiently in advance of construction requirements to allow for possible need of re-submittals, including the specified review time for the ENGINEER.
c. ENGINEER's review time for shop drawings and O&M manuals shall be no more than 30 calendar days. Resubmittals will be subject to the same review time.
d. Submittals of operation and maintenance data shall be provided within 30 days of approval of the related shop drawing(s).

e. Before submission to the ENGINEER, review shop drawings as follows:
    1) Make corrections and add field measurements, as required.
    2) Use any color for its notations except red (reserved for the ENGINEER's notations) and black (to be able to distinguish notations on black and white documents).
    3) Identify and describe each deviation or variation from Contract Documents.
    4) Include the required CONTRACTOR's Certification statement.
    5) Provide field measurements (as needed).
    6) Coordinate with other submittals.
    7) Indicate relationships to other features of the Work.
    8) Highlight information applicable to the Work and/or delete information not applicable to the Work.
f. Submit the following number of copies:
    1) Shop drawings (including working drawings and product data)- CONTRACTOR shall submit one hard copy of the submittals to be kept by the OWNER and ENGINEER. If the CONTRACTOR would like a copy returned, then the CONTRACTOR shall submit two hard copies of the submittals
    2) Product Data – three copies
    3) Samples – a minimum of two or as stated in the representative Sections.
    4) Site Usage Plane – One copy.
    5) Schedule of Values – One copy.
    6) Payment application format – One copy.
g. If CONTRACTOR considers any correction indicated on the shop drawings to constitute a change to the Contract Documents, provide written notice thereof to the ENGINEER immediately; and do not release for manufacture before such notice has been received by the ENGINEER.
h. When the shop drawings have been completed to the satisfaction of the ENGINEER, carry out the construction in accordance therewith; and make no further changes therein except upon written instructions from the ENGINEER.

2. Engineer's Responsibilities
    a. ENGINEER will not review shop drawings (including working drawings and product data) that do not include the CONTRACTOR's approval stamp. Such submittals will be returned to the CONTRACTOR, without action, for correction.

b. Partial shop drawings (including working drawings and product data) will not be reviewed. If, in the opinion of the ENGINEER, a submittal is incomplete, that submittal will be returned to the CONTRACTOR for completion. Such submittals may be returned with comments from ENGINEER indicating the deficiencies requiring correction.
c. If shop drawings (including working drawings and product data) meet the submittal requirements, ENGINEER will forward copies to appropriate reviewer(s). Otherwise, noncompliant submittals will be returned to the CONTRACTOR without action – with the ENGINEER retaining one copy.
d. Submittals which are transmitted in accordance with the specified requirements will be reviewed by the ENGINEER within the time specified herein. The time for review will commence upon receipt of submittal by ENGINEER.

3. Review of Shop Drawings (Including Working Drawings and Product Data) and Samples
   a. The review of shop drawings, working drawings, data and samples will be for general conformance with the design concept and Contract Documents. They shall not be construed:
      1) As permitting any departure from the Contract requirements.
      2) As relieving the CONTRACTOR of responsibility for any errors, including details, dimensions, and materials.
      3) As approving departures from details furnished by the ENGINEER, except as otherwise provided herein.
      4) As approving deletion of anything missing or omitted from the shop drawing.
   b. The CONTRACTOR remains responsible for details and accuracy, for coordinating the work with all other associated work and trades, for selecting fabrication processes, for techniques of assembly, and for performing work in a safe manner.
   c. If the shop drawings (including working drawings and product data) or samples as submitted describe variations and indicate a deviation from the Contract requirements that, in the opinion of the ENGINEER are in the interest of the OWNER and are so minor as not to involve a change in Contract Price or Contract Time, the ENGINEER may return the reviewed drawings without noting an exception.
   d. Only the ENGINEER will utilize the color “RED” in marking submittals.
   e. Shop drawings will be returned to the CONTRACTOR with one of the following codes:
      1) Code 1 – “APPROVED” – This code is assigned when there are no notations or comments on the submittal. When returned under this code the CONTRACTOR may release the equipment and/or material for manufacture.
      2) Code 2 – “APPROVED AS NOTED” – This code is assigned when a confirmation of the notations and comments IS NOT required by the CONTRACTOR. The CONTRACTOR may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product.

3) Code 3 – “APPROVED AS NOTED/CONFIRM” – This combination of codes is assigned when a confirmation of the notations and comments is required by the CONTRACTOR. The CONTRACTOR may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product. This confirmation shall specifically address each omission and nonconforming item that was noted. Confirmation is to be received by the ENGINEER, within 15 calendar days of the date of the ENGINEER’s transmittal requiring the confirmation.
4) Code 4 – “APPROVED AS NOTED/RESUBMIT” – This combination of codes is assigned when notations and comments are extensive enough to require a resubmittal of the entire package. This resubmittal is to address all comments, omissions, and non-conforming items that were noted. Resubmittal is to be received by the ENGINEER within 30 calendar days of the date of the ENGINEER’s transmittal requiring the resubmittal.
5) Code 5 – “NOT APPROVED/RESUBMIT” – This code is assigned when the submittal does not meet the intent of the contract documents. The CONTRACTOR must resubmit the entire package revised to bring the submittal into conformance. It may be necessary to resubmit using a different manufacturer/vendor to meet the requirements of the contract documents.
6) Code 6 – “COMMENTS ATTACHED” – This code is assigned where there are comments attached to the returned submittal, which provide additional data to aid the CONTRACTOR.
7) Code 7 – “REVIEWED/RECEIPT ACKNOWLEDGED” (Not subject to ENGINEER’s Review or Approval)” – This code is assigned to acknowledge receipt of a submittal that is not subject to the ENGINEER’s review and approval and is being filed for informational purposes only. This code is generally used in acknowledging receipt of means and methods of construction work plans, field conformance test reports, and health and safety plans.
8) Codes 1 through 5 designate the status of the reviewed submittal with Code 6 showing there has been an attachment of additional data.

4. Electronic Transmission
   a. ACTION SUBMITTALS may be transmitted by electronic means provided the following conditions are met:
      1) The above-specified transmittal form is included.
      2) All other requirements specified above have been met including, but not limited to, coordination by the CONTRACTOR, review and approval by the CONTRACTOR, and the CONTRACTOR’s Certification.
      3) The submittal contains no pages or sheets larger than 11 x 17 inches.
      4) With the exception of the transmittal sheet, the entire submittal is included in a single file.
      5) The electronic files are PDF format (with printing enabled).

6) In addition, transmit three hard copy (paper) originals to the ENGINEER.
7) The ENGINEER's review time will commence upon receipt of the hard copies of the submittal.
8) Submittals that require certification, corporate seal, or professional embossment (i.e. P.E.'s, Surveyors, etc.) transmit at least two hard-copy originals to the ENGINEER. In addition, provide additional photocopied or scanned copies, as specified above, showing the required certification, corporate seal, or professional seal.

B. Informational Submittals
1. CONTRACTOR's Responsibilities
a. Number of copies: Submit three copies, unless otherwise indicated in individual Specification sections.
b. Refer to individual technical Specification Sections for specific submittal requirements.
2. Engineer's Responsibilities
a. The ENGINEER will review each informational submittal within 10 days. If the informational submittal complies with the Contract requirements, ENGINEER will file for the project record and transmit a copy to the OWNER. ENGINEER may elect not to respond to CONTRACTOR regarding informational submittals meeting the Contract requirements.
b. If an informational submittal does not comply with the Contract requirements, ENGINEER will respond accordingly to the CONTRACTOR within 15 days. Thereafter, the CONTRACTOR shall perform the required corrective action, including retesting, if needed, until the submittal, in the opinion of the ENGINEER, is in conformance with the Contract Documents.
3. Electronic Transmission
a. INFORMATIONAL SUBMITTALS may be transmitted by electronic means providing all of the following conditions are met:
1) The above-specified transmittal form is included.
2) The submittal contains no pages or sheets larger than 11 x 17 inches.
3) With the exception of the transmittal sheet, the entire submittal is included in a single file.
4) The electronic files are PDF format (printing enabled).
5) Submittals that require certification, corporate seal, or professional embossment (i.e. P.E.'s, Surveyors, etc.) transmit two hard-copy originals to the ENGINEER.

END OF SECTION 01300

SECTION 01300

SUBMITTALS

ATTACHMENT A

Professional Design Services Performance Certification

1. My name is _____

2. My Florida State Professional Engineering License number is _____

3. My license expires _____, 20___

4. The Project for which I have performed professional design services is described as:

   _____
   _____
   _____
   _____

5. The Specification Section(s) under which I have performed my services is/are:

   _____
   _____
   _____
   _____

6. The name and address of the individual or entity for whom I have performed my professional design services is:

   _____
   _____
   _____
   _____

ATTACHMENT A (continued)

Professional Design Services Performance Certification (continued)

7. I hereby certify that, to the best of my knowledge, information and belief, I have performed or supervised the performance of the professional design services hereunder, and that said services have been performed in accordance with all applicable local, state and federal codes, rules and regulations and in accordance with the standard of care currently expected of professional engineers/architects performing similar services for projects of similar size and complexity in the State of Florida.

_____
Signature

_____
Typed or Printed Name

_____
Name of Firm

_____
Street Address

[SEAL] _____
City/State/Zip Code

Telephone:_____

Fax:_____

SECTION 01310

CONSTRUCTION SCHEDULING

PART 1- GENERAL

1.01 SCOPE OF WORK

A. A Critical Path Method (CPM) construction schedule shall be used to control the work of this Contract and to provide a definitive basis for determining job progress. The construction schedule shall be prepared and maintained by the CONTRACTOR. All work shall be done in accordance with the established CPM schedule; and, the CONTRACTOR and all subcontractors shall be responsible for cooperating fully in effectively utilizing the CPM schedule.

B. The CPM schedule to be prepared and submitted by the CONTRACTOR shall consist of a CPM network (diagram of activities), a computer-generated schedule (print-out), and reports as specified herein.

C. Computer-based schedule shall be completed in either Oracle-Primavera, P6 Profession Project Management, or Microsoft Project.

1.02 QUALIFICATIONS

A. The CONTRACTOR shall have the capability of preparing and utilizing the specified CPM scheduling technique. A written statement of CPM capability shall be submitted by the CONTRACTOR that will verify the CONTRACTOR's organization has in-house capability qualified to use the technique, or that the CONTRACTOR employs a consultant who is so qualified. Capability shall be verified by description of the construction projects to which the CONTRACTOR or his/her consultant has successfully applied the CPM scheduling technique and which were controlled throughout the duration of the project by means of systematic use and updating of a computer-based CPM schedule. The submittal shall include the name of the individual on the CONTRACTOR's staff who will be responsible for the CPM schedule and for providing the required updating information.

1.03 NETWORK REQUIREMENTS

A. The network of activities shall show the order and inter-dependence of activities and the sequence in which the work is to be accomplished as planned by the CONTRACTOR. The basic concept of a network analysis diagram shall be followed to show how the start of a given activity is dependent on the completion of preceding activities and its completion restricts the start of following activities.

B. Detailed network activities shall include: the procurement of major materials and equipment, fabrication of materials and equipment and their delivery, construction activities, installation and testing, start-up and training. Break the work into activities with durations no longer than 20 working days each, except as to non-construction activities (such as procurement of materials and delivery of equipment) and any other activities for which the ENGINEER may concur showing longer duration. To the extent feasible, activities related to a specific physical area of the work shall be grouped on the network for ease of understanding and simplification.

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C. Separate activities shall be provided for each significant identifiable function in each trade area in each facility. Activities shall be so identified to clearly indicate the work included in each activity.

D. Each activity on the network shall have the following indicated:
   1. Unique activity identification number
   2. Activity description
   3. Original duration
   4. Remaining duration
   5. Early start date
   6. Early finish date
   7. Late start date
   8. Late finish date
   9. Total float

E. The selection and number of activities shall be subject to the ENGINEER's approval.

F. The ENGINEER’s review will only be for conformance with the Contract Time and those sequences of work indicated in or required by the contract documents. After review, the ENGINEER will return the CPM schedule submittal to the CONTRACTOR as either “Amend and Resubmit” or “No Exceptions Taken”. Submittal stamped as “No Exceptions Taken” will represent the most-current Contract Schedule as of the date of the submittal. Neither the ENGINEER’s review of a CPM Schedule, nor the ENGINEER’s statement of “No Exceptions Taken”, will relieve the CONTRACTOR from responsibility for complying with the Contract Time required by the Contract Documents, or from completing any omitted Work within the Contract Time(s).

1.04 SUBMITTALS

A. Submit as per Section 01300. Each computer-generated schedule submittal from the CPM activity network shall include the following minimum items:
   1. Activity details (specified in Paragraph 1.03 D)
   2. Graphic presentation of the CPM network
   3. Project information
   4. Schedule shall show the following:
      a. Duration
      b. Start date (effective date of the Notice to Proceed)
      c. Fixed milestones (completion dates)
      d. Floating milestones (phasing or staging goals, as specified)
      e. Special construction sequences, as specified
      f. Substantial and final completion
      g. Identify the critical path
      h. Identify work calendar (work days vs. calendar days)
      i. Allowances for normal weather
      j. Holidays to be observed by the CONTRACTOR’s workforce

B. Each schedule submitted shall include the following reports:

1. List of Activities (sorted by activity number)
2. Early Start
3. Total Float
4. Predecessors/Successors

1.05 IMPLEMENTATION SCHEDULE

A. Within 15 days following the receipt of the Notice to Proceed, submit an Interim Schedule indicating the planned operations during the first 60 calendar days after Notice to Proceed. The general approach for the balance of the project shall be indicated.

B. Within 30 days following the receipt of Notice to Proceed, provide a detailed schedule showing the entire Scope of Work.

C. ENGINEER's review of the schedule submittals shall not relieve CONTRACTOR from responsibility for any deviations from the Contract Documents unless CONTRACTOR has in writing called ENGINEER's attention to such deviations at the time of submission and ENGINEER has given written concurrence to the specific deviations, nor shall any concurrence by ENGINEER relieve CONTRACTOR from responsibility for errors and omissions in the submittals. Concurrence of the CPM Activity Network by the ENGINEER is advisory only and shall not relieve the CONTRACTOR of responsibility for accomplishing the work within the Contract completion date(s).

D. Upon acceptance of, or concurrence by the OWNER of the CONTRACTOR’s Detailed Schedule, the Detailed Schedule shall be recognized as the CONTRACTOR’s baseline or as-planned project schedule. The baseline or as-planned schedule shall not include any actual progress earned during its development.

E. Once the baseline or as-planned schedule is complete, updates of the Interim Schedule shall be discontinued, and subsequent schedule updates shall be based on the baseline schedule.

F. Any requests to changes that affect the schedule for the project shall be submitted with justification and within the timelines as per SJCUD general conditions.

1.06 PROGRESS REPORTING

A. CONTRACTOR shall submit monthly status reports (updates) of the CPM schedule. At each monthly progress meeting, the CONTRACTOR and ENGINEER shall meet at the jobsite and jointly evaluate the status of each activity on which work has started or is due to start, based on the preceding CPM schedule; to show actual progress, to identify those activities started and those completed during the previous period, to show the estimated time required to complete or the percent complete of each activity started but not yet completed and to reflect any changes indicated for the network. Activities shall not be considered to be complete until they are, in fact, 100 percent complete.

B. At each progress meeting, submit a narrative report based on the CPM schedule evaluation described above, in a format agreed upon by the CONTRACTOR and the ENGINEER. The report shall include a description of the progress during the previous period in terms of completed activities, an explanation of each activity which is showing a delay, a description of problem areas, current and anticipated delaying factors and their estimated impact on performance of other activities and completion dates and an explanation of corrective action taken or proposed. This report, as well as the CPM Status Report, will be discussed at each progress meeting.

1.07 RESPONSIBILITY FOR SCHEDULE COMPLIANCE

A. Whenever it becomes apparent from the current CPM schedule and CPM Status Report that delays to the critical path have resulted and the contract completion date will not be met, or when so directed by the ENGINEER, take some or all of the following actions at no additional cost to the OWNER. Submit to the ENGINEER for approval, a written statement of the steps intended to take to remove or arrest the delay to the critical path in the approved schedule.
   1. Increase construction manpower in such quantities and crafts as will substantially eliminate the backlog of work.
   2. Increase the number of working hours per shift, shifts per day, working days per week, the amount of construction equipment, or any combination of the foregoing, sufficiently to substantially eliminate the backlog of work.
   3. Reschedule activities to achieve maximum practical concurrence of accomplishment of activities and comply with the revised schedule.

B. If when so requested by the ENGINEER, failure to submit a written statement of the steps intended to take or should fail to take such steps as approved by the ENGINEER, the ENGINEER may direct the CONTRACTOR to increase the level of effort in man-power (trades), equipment and work schedule (overtime, weekend and holiday work, etc.) to be employed by the CONTRACTOR in order to remove or arrest the delay to the critical path in the approved schedule and the CONTRACTOR shall promptly provide such level of effort at no additional cost to the OWNER.

1.08 ADJUSTMENT OF CONTRACT SCHEDULE AND COMPLETION TIME

A. If the CONTRACTOR desires to make changes in his/her method of operating which affect the current contract CPM schedule, the CONTRACTOR shall notify the ENGINEER in writing stating what changes are proposed and the reason for the change. After the ENGINEER reviews the changes, the CONTRACTOR shall revise and submit the network schedule, without additional cost to the OWNER, all of the affected portions of the CPM network. The CPM schedule shall be adjusted by the CONTRACTOR only after prior review of his/her proposed changes by the ENGINEER. Adjustments may consist of changing portions of the activity sequence, activity durations, division of approved activities, or other adjustments. The addition of extraneous, non-working activities and activities which add unapproved restraints to the CPM schedule are not allowed.

B. If the completion of any activity, whether or not critical, falls more than 100 percent behind its current schedule duration, submit a schedule adjustment showing each

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such activity divided into two activities reflecting completed versus uncompleted work.

C. Shop drawings which are not approved on the first submittal or within the schedule time and equipment which do not pass the specified tests shall be immediately rescheduled.

D. The contract completion time will be adjusted only for causes specified in this Contract. In the event the CONTRACTOR requests an extension of any contract completion date, he/she shall furnish such justification and supporting evidence as the ENGINEER may deem necessary to determine whether the CONTRACTOR is entitled to an extension of time under the provisions of this Contract. The ENGINEER will, after receipt of such justification and supporting evidence, make findings of fact and will advise the CONTRACTOR in writing thereof. If the ENGINEER finds that the CONTRACTOR is entitled to any extension of any contract completion date, the ENGINEER's determination as to the total number of days extension shall be based upon the current contract CPM schedule and on all data relevant to the extension. Such data shall be included in the next updating of the schedule. Actual delays in activities which, according to the CPM schedule, do not affect any contract completion date shown by the critical path in the network will not be the basis for a change therein.

E. Each request for change in any contract completion date shall be submitted by the CONTRACTOR to the ENGINEER within 30 days after the beginning of the delay for which a time extension is requested but before the date of final payment under this Contract. No time extension will be granted for requests which are not submitted within the foregoing time limit.

1. From time to time it may be necessary for the contract schedule or completion time to be adjusted by the OWNER to reflect the effects of job conditions, unusual weather, technical difficulties, strikes, unavoidable delays on the part of the OWNER or its representatives and other unforeseeable conditions which may indicate schedule adjustments or completion time extensions. Under such conditions, the ENGINEER will direct the CONTRACTOR to reschedule the work or contract completion time to reflect the changed conditions and the CONTRACTOR shall revise his/her schedule accordingly. No additional compensation will be made to the CONTRACTOR for such schedule changes except for unavoidable overall contract time extensions beyond the actual completion of all unaffected work, in which case the CONTRACTOR shall take all possible action to minimize any time extension and any additional cost to the OWNER. Available float time in the CPM schedule may be used by the OWNER as defined by the ENGINEER, as well as by the CONTRACTOR.

F. The OWNER controls the float time in the contract CPM network and, therefore, without obligation to extend either the overall completion date or any intermediate completion dates set out in the CPM network, the OWNER may initiate changes to the work that absorb float time only. OWNER initiated changes that affect the critical path on the approved CPM network shall be the sole grounds for extending (or contracting) said completion dates. CONTRACTOR- initiated changes that encroach on the float time identified in the approved CPM network may be accomplished with

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the OWNER's concurrence. Such changes, however, shall give way to OWNER-initiated changes competing for the same float time.

END OF SECTION 01310

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SECTION 01370

SCHEDULE OF VALUES & SCHEDULE OF ASSETS

PART 1-GENERAL

1.01 REQUIREMENTS INCLUDED

A. Submit to the OWNER a schedule of values and schedule of assets allocated to the various portions of the Work, within 14 days after the effective date of the Agreement.

B. Upon request of the OWNER, support the values with data which will substantiate their correctness.

C. The schedule of values, unless objected to by the ENGINEER, shall be used only as the basis for the CONTRACTOR's applications for payment.

1.02 RELATED REQUIREMENTS

A. Standard General Conditions of the Construction Contract are included in the Front End Agreement Documents.

1.03 FORM AND CONTENT OF SCHEDULE OF VALUES

A. Type schedule on an 8--1/2-inch x 11-inch or 8--1/2-inch x 14-inch white paper furnished by the OWNER; CONTRACTOR's standard forms and automated printout will be considered for approval by the ENGINEER upon CONTRACTOR's request. Identify schedule with:
   1. Title of project and location.
   2. ENGINEER and project number.
   3. Name and address of CONTRACTOR.
   4. Contract designation.
   5. Date of submission.

B. Schedule shall list the installed value of the component parts of the Work in sufficient detail to serve as a basis for computing values for progress payments during construction.

C. Identify each line item with the number and title of the respective major section of the specifications.

D. For each major line item, also list sub values of major products or operations under the item.

E. For the various portions of the Work:
   1. Each item shall include a directly proportional amount of the CONTRACTOR's overhead and profit.
   2. For items on which progress payments will be requested for stored materials, break down the value into:
      a. The cost of the materials, delivered and unloaded, with taxes paid. Paid invoices are required for materials upon request by the ENGINEER.
      b. The total installed value.

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F. The sum of all values listed in the schedule shall equal the total Contract Sum.

G. Any items on the bid form denoted as allowances shall be accompanied with actual receipts showing the actual costs. The OWNER will only reimburse the CONTRACTOR for actual costs incurred and shall not include any additional markups for these specific allowances. All remaining unused allowances amounts will be returned to the OWNER at the end of construction.

H. Any items on the bid form denoted as unit price items shall be field verified by the ENGINEER and/or RPR for each payment application. All remaining unused portions of each unit price item will be returned to the OWNER at the end of construction.

1.04 SUBSCHEDULE OF UNIT MATERIAL VALUES

A. Submit a sub-schedule of unit costs and quantities for:
   1. Products on which progress payments will be requested for stored products.

B. The form of submittal shall parallel that of the Schedule of Values, with each item identified the same as the line item in the Schedule of Values.

C. The unit quantity for bulk materials shall include an allowance for normal waste.

D. The unit values for the materials shall be broken down into:
   1. Cost of the material delivered and unloaded at the site, with taxes paid.
   2. Copies of invoices for component material shall be included with the payment request in which the material first appears.

E. The installed unit value multiplied by the quantity listed shall equal the cost of that item in the Schedule of Values.

1.05 FORM AND CONTENT OF SCHEDULE OF ASSET VALUES

A. For each asset listed, provide a constructed cost which will include an allocation of construction activities including but not limited to, demolition, sitework, specialties, materials, labor, general conditions, and overhead and profit associated with the construction of the asset.

B. The combined value of the assets will equal the GMP for the project and will require adjustments as necessary due to change orders. The schedule of asset values will be updated on a monthly basis and will be included in the monthly pay request application for approval.

C. The OWNER reserves the right to edit this list prior to the first pay application and may add up to 10 percent more items than have been identified in the list.

END OF SECTION 01370

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SECTION 01390

CONSTRUCTION PHOTOGRAPHS AND VIDEOTAPING

PART 1 – GENERAL

1.01 REQUIREMENTS INCLUDED

A. CONTRACTOR shall provide competent photographer to take preconstruction video, photographs, and aerials throughout the project.

1.02 PHOTOGRAPHY REQUIRED

A. A preconstruction video is required to be taken within four weeks prior to the start of construction. The preconstruction video is required to document the existing site conditions to establish a baseline for the existing conditions. The preconstruction video shall be on DVD format and will provide the date and time of the video on the recording during playback.

B. Monthly Construction Photographs
   1. The CONTRACTOR shall take photographs of each structure/building following:
      a. Rebar slab/foundation mat
      b. All below slab piping

1.03 COSTS OF PHOTOGRAPHY

A. The CONTRACTOR shall pay costs for specified photography and prints. Additional prints beyond those specified here shall be charged to interested party.

1.04 OWNERSHIP OF PROPERTY

A. Upon receipt of the photographs, the OWNER will be deemed owner of the photographs.

PART 2 – PRODUCTS

2.01 PHOTOGRAPHS, VIDEOS

A. Color

1.	Paper:	Single weight, color print paper.
2.	Finish:	Smooth surface glossy.
3.	Photograph Size:	8½-inch x 11-inch

B. Provide properly labeled CDs with electronic records of all photographs with identification for exposure number, orientation of view, and date of exposure.

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PART 3 – EXECUTION

3.01 TECHNIQUE

A. Factual presentation

B. Correct exposure and focus
   1. High resolution and sharpness
   2. Maximum depth-of-field
   3. Minimum distortion

3.02 AUDIOVISUAL RECORDING

A. The recordings shall contain coverage of all surface features within the construction zone of influence. These features shall include, but not be limited to, all features of existing access road and bridge, landscaping and landscape buffer area, trees, and fences. Of particular concern shall be the existence or non-existence of any faults, fractures or defects.

B. Video coverage shall include all surface conditions located within the zone of influence supported by appropriate audio description. Panning, zoom-in and zoom-out rates shall be sufficiently controlled to maintain a clear view of the object.

C. Accompanying the video recording of each video tape shall be a corresponding and simultaneously recorded audio recording. This audio recording, exclusively containing the commentary of the camera operator, shall assist in viewer orientation and in any needed identification, differentiation, clarification, or objective description of the features being shown in the video portion of the recording. The audio recording shall also be free from any conversation between the camera operator and any other production technicians.

D. Visibility: All recording shall be performed during times of good visibility; no recording shall be done during periods of significant precipitation, mist or fog. The recording shall only be done when sufficient sunlight is present to properly illuminate the subject and to produce sharp, bright video recordings of those subjects.

E. In order to ensure the continuity of coverage, the coverage shall consist of a single continuous unedited recording which begins at one end of the construction area.

F. The average rate of travel during a particular segment of coverage shall be directly proportional to the number, size, and value of the surface features within that construction area’s zone of influence.

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G. Camera Operation

1. Camera Height and Stability: When conventional wheeled vehicles are used as conveyances for the recording system, the vertical distance between the camera lens and the ground shall not exceed 10 feet. The camera shall be firmly mounted such that transport of the camera during the recording process will not cause an unsteady picture.
2. Camera Control: Camera pan, tilt, zoom-in and zoom-out rates shall be sufficiently controlled such that recorded objects shall be clearly viewed during video tape playback. In addition, all other camera and recording system controls, such as lens focus and aperture, video level, pedestal, white balance and electrical focus shall be properly controlled or adjusted to maximize picture quality.
3. Viewer Orientation Techniques: The audio and video portions of the recording shall maintain viewer orientation. To this end, overall establishing views of all visible house and business addresses shall be utilized. In areas where the proposed construction location will not be readily apparent to the video tape viewer, highly visible yellow flags shall be placed, by the CONTRACTOR, in such a fashion as to clearly indicate the proposed center line of construction.

END OF SECTION 01390

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SECTION 01410

TESTING AND TESTING LABORATORY SERVICES

PART 1- GENERAL

1.01 REQUIREMENTS INCLUDED

A. The CONTRACTOR will employ and pay for the services of an Independent Testing Laboratory to perform testing specifically indicated in the Contract Documents. This testing includes all required testing to determine soil/density, concrete compressive strength, asphalt testing, and reinforcement testing.
   1. CONTRACTOR shall cooperate with the laboratory to facilitate the execution of its required services.

B. The OWNER will reimburse the CONTRACTOR for the costs of all passing laboratory tests from the laboratory based on actual invoices. Failed tests will be back-charged to the CONTRACTOR at the time of final payment. All required testing shall be coordinated with and scheduled by the CONTRACTOR.

C. Payment shall be made from the testing allowance. Any costs for coordination of these efforts, markups, or incidentals by the CONTRACTOR shall be included in the CONTRACTOR'S GMP and will not be allowed as part of the allowance.

D. SJCUD will be responsible for any required water quality testing and bacteriological clearance of water mains and or other potable water components.

1.02 RELATED REQUIREMENTS

A. Conditions of the Contract: Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities.

B. Respective sections of specifications: Certification of products.

C. Each specification section listed: Laboratory tests required, and standards for testing.

D. Testing Laboratory inspection, sampling and testing is required for but not limited to the following:
   1. Section 02100: Site Preparation
   2. Section 02200: Excavating, Backfilling, and Grading for Structures
   3. Section 02221: Trenching, Bedding, and Backfill for Pipes
   4. Section 03300: Cast-in-Place Concrete

1.03 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

A. Laboratory is not authorized to:
   1. Release, revoke, alter or enlarge on requirements of Contract Documents.
   2. Approve or accept any portion of the Work.
   3. Perform any duties of the CONTRACTOR.

1.04 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with laboratory personnel and provide access to Work.

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B. Secure and deliver to the laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.

C. Provide to the laboratory the preliminary design mix proposed to be used for concrete, and other material mixes which require control by the testing laboratory.

D. Materials and equipment used in the performance of work under this Contract are subject to inspection and testing at the point of manufacture or fabrication. Standard specifications for quality and workmanship are indicated in the Contract Documents. The ENGINEER may require the CONTRACTOR to provide statements or certificates from the manufacturers and fabricators that the materials and equipment provided by them are manufactured or fabricated in full accordance with the standard specifications for quality and workmanship indicated in the Contract Documents. All costs of this testing and providing statements and certificates shall be a subsidiary obligation of the CONTRACTOR, and no extra charge to the OWNER shall be allowed on account of such testing and certification.

E. Furnish incidental labor and facilities:
   1. To provide access to Work to be tested.
   2. To obtain and handle samples at the Project site or at the source of the product to be tested.
   3. To facilitate inspections and tests.
   4. For storage and curing of test samples.

F. Notify laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.
   1. When tests or inspections cannot be performed after such notice, reimburse OWNER for laboratory personnel and travel expenses incurred due to CONTRACTOR'S negligence.
   2. All testing shall be coordinated by the CONTRACTOR and all testing shall be witnessed by the OWNER’s Representative.

PART 2 – PRODUCTS

(NOT USED)

PART 3 – EXECUTION

(NOT USED)

END OF SECTION 01410

SECTION 01465

EQUIPMENT TESTING AND STARTUP

PART 1- GENERAL

1.01 SCOPE OF WORK

A. The CONTRACTOR shall provide a competent field services technician of the manufacturers of all equipment furnished under Divisions 11, 13, 15, and 16 to supervise installation, adjustment, initial operating and testing, performance testing, final acceptance testing and startup of the equipment.

1.02 RELATED WORK

A. Operation and maintenance data is included in Section 01730.

B. Submittals are included in Section 01300.

C. Performance and acceptance testing and startup requirements are included in the respective sections of Division 11, 13, 15 and 16.

1.03 SUBMITTALS

A. The CONTRACTOR shall provide the name, address, and resume of proposed field services technicians at least 30 days in advance of the need of such services.

B. Submit, in accordance with Section 01300, detailed testing procedures for shop tests, field performance tests, and final acceptance tests as specified in various equipment specifications.

C. Submittals shall include at a minimum the following:
   1. Testing schedule including proposed dates and times of testing.
   2. Summary of power, lighting, chemicals, water, sludge, gas, etc. needs and identification of who will provide them.
   3. Outline specific assignments of the responsibilities of the CONTRACTOR and manufacturer's factory representative or field personnel.
   4. Detailed description of step-by-step testing requirements with reference to appropriate standardized testing procedures and laboratory analyses by established technical organizations (e.g. ASTM, Standard Methods, etc.)
   5. Sample of forms that will be used to collect and record test data and to present tabulated test results.

D. Provide copies of all final testing reports including field, shop, performance, and acceptance testing.

1.04 QUALITY ASSURANCE

A. Field service technicians shall be competent and experienced in the proper installation, adjustment, operation, testing, and startup of the equipment and systems being installed.

B. Manufacturer's sales and marketing personnel will not be accepted as field service technicians.

PART 2- PRODUCTS

(NOT USED)

PART 3- EXECUTION

3.01 PRELIMINARY REQUIREMENTS

A. After installation of the equipment has been completed and the equipment is presumably ready for operation, before it is operated by others, the manufacturer's field service technician shall inspect, operate, test and adjust the equipment. The inspection shall include at least the following points where applicable:
   1. Soundness (without crack or otherwise damaged parts).
   2. Completeness in all details and as specified and required.
   3. Correctness of setting, alignment, and relative arrangement of various parts.
   4. Adequacy and correctness of packing, sealing, and lubricants.

B. Upon completion of this work, the manufacturer's field service technician shall submit a signed report of his/her inspection, operation, adjustments, and tests.

3.02 WITNESS REQUIREMENTS

A. Shop tests or factory tests may be witnessed by the OWNER and/or ENGINEER, as required by the various equipment specifications. Factory test reports must be provided and approved prior to shipment of any equipment to the site.

B. Field performance and acceptance tests shall be performed in the presence of the OWNER and/or ENGINEER.

3.03 STARTUP AND ACCEPTANCE OF THE WORK

A. General requirements
   1. Successfully execute the step-by-step procedure of startup and performance demonstration specified herein.
   2. The startup and performance demonstration shall be successfully executed prior to Substantial Completion and acceptance by the OWNER.
   3. All performance tests and inspections shall be scheduled at least 5 working days in advance or as otherwise specified with the OWNER and the ENGINEER. All performance tests and inspections shall be conducted during the work week of Monday through Thursday, Training and/or witness testing shall not take place on Fridays unless otherwise specifically authorized.

B. Preparation for Startup
   1. Upon completion of the facilities and all related systems shall be flushed with potable or reclaimed water and hydraulically water tightness tested for 24 hours and checked for leaks, cracks, and defects.

   2. All mechanical and electrical equipment shall be checked to ensure that it is in good working order and properly connected. Preliminary run-ins of the various pumps, fans, and other remaining equipment shall be made. Each

equipment manufacturer shall certify the system is ready for operation. All systems shall be cleaned and purged as required. All sumps, tanks, basins, chambers, pump wells, and pipelines which are hydraulically checked shall be drained and returned to their original condition once the testing is completed.

3. All instruments and controls shall be calibrated through their full range. All other adjustments required for proper operation of all instrumentation and control equipment shall be made.
4. No testing or equipment operation shall take place until it has been verified by the ENGINEER that all specified safety equipment has been installed and is in good working order.

C. Facilities Startup

1. Startup period shall not begin until all new treatment facilities and equipment have been tested as specified and are ready for operation. The OWNER shall receive spare parts, safety equipment, tools, and maintenance equipment, lubricants, approved O&M manuals. All valve tagging shall also be completed prior to startup.
2. All instrumentation and SCADA shall be tested and able to operate completely in automatic mode. Perform field operational tests including all SCADA and automatic functions prior to startup. This shall be implemented and demonstrated to confirm that the station is ready to begin the 5-day operational test required for substantial completion. Operation is “hand” without all instruments, SCADA, and controls in place is not an acceptable means to dictate startup. All programming and controls shall be performed by an OWNER approved SCADA System Integrator
3. In the event of failure to demonstrate satisfactory performance of the facility on the first or any subsequent attempt, all necessary alterations, repairs and replacements shall be made. When the facility is again ready for operation, it shall be brought on line, and a new test shall be started. This procedure shall be repeated until the facility has operated continuously to the satisfaction of the OWNER and ENGINEER for the specified duration.
4. The OWNER will furnish all operating personnel (other than vendor’s or subcontractor’s) needed to operate equipment during the testing period; however, said personnel will perform their duties under the CONTRACTOR’S direct supervision. Until the performance testing is completed and units and systems are accepted by the OWNER as substantially complete, the CONTRACTOR shall be fully responsible for the operation and maintenance of the facilities.
5. The OWNER will provide all water and electricity required for the testing. However, the CONTRACTOR shall provide all necessary personnel (field, vendor, subcontractors) on an 8 hour per day basis at the facilities on a 24 hour per day basis locally during the startup period. All chemicals for performance testing and startup shall be provided by the OWNER. Major equipment suppliers shall include, but not be limited, to the following:
   a. High Service Pumps
   b. Reverse Osmosis Skid System
   c. Generator
   d. Odor Control System (Bid Alternate)

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e. Packed Tower Aeration System (Bid Alternate)
f. Instrumentation and control equipment for all processes and equipment

6. Do not, at any time during startup, allow for the facility to be operated in a manner which subjects equipment to conditions that are more severe than the maximum allowable operating conditions for which the equipment was designed.

END OF SECTION 01465

SECTION 01500

TEMPORARY FACILITIES

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section includes general requirements relating to the CONTRACTOR's responsibilities for temporary construction facilities.

1.02 CONSTRUCTION FACILITIES

A. General:
   1. Temporary facilities and protective devices include, but are not necessarily limited to, temporary barricades, fences, bridges, guards, temporary utilities, steel plates over trenches, maintenance of traffic, project identification signs, and construction of haul roads.
   2. Use materials of size, shape, and strength suitable for intended use, in construction of the above.
   3. Conduct construction operations to cause least inconvenience possible to the County staff and ENGINEER.
   4. Where required, erect and maintain signs, fences, barricades, and pedestrian bridges, and supply guards and flagmen for protection of public.
   5. Obtain ENGINEER's approval before transporting or locating temporary facilities within construction site.
   6. All facilities must comply and be installed as per the Florida Building Code latest edition.

B. Temporary Fencing:
   1. Furnish and construct, as required, to fence off excavation, storage, and operating areas.
   2. Erect suitably constructed temporary fences, neat in appearance, and meeting ENGINEER's approval.
   3. Unless otherwise indicated, fences shall be 6-feet high.

C. Barricades
   1. Barricade or close openings in roadways, floors, walls, or other parts of structures or walkways while openings are not in regular use.
   2. Use barricades that are structurally sound, suitable for intended use, neat in appearance, and of size and arrangement, as approved by the ENGINEER.

D. Field Office Facilities for the CONTRACTOR
   1. Furnish adequate field office facilities for their own use during the execution of this Contract.
   2. Location of these facilities shall be coordinated with the OWNER and ENGINEER.
   3. Pay for installation, maintenance, and monthly electric service, internet, and telephone charges in this office.
   4. Pay for installation and maintenance for potable water and toilet facilities for this office.

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5. Provide portable UL-rated, Class A fire extinguishers for site offices and similar spaces. In other locations, provide portable UL-rated Class ABC dry chemical extinguishers or a combination of NFPA recommended classes for the exposure. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.

1.03 TEMPORARY UTILITIES

A. Water:
   1. The OWNER shall furnish water required during entire construction period for the contract at no cost to the CONTRACTOR.
   2. CONTRACTOR shall make the necessary arrangements for connection, provide all piping, backflow devices, and appurtenances required.
   3. Assure the availability of drinking water for their work force.
   4. Provide temporary pumps, tanks and compressors as necessary to produce required pressures.

B. Electricity: Make necessary arrangements and coordinate with the Owner for temporary electric service and lighting during the construction period.
   1. Ensure electric service of sufficient capacity and characteristics to supply proper current for various types of construction tools, motors, welding machines, light, heating plant, pumps, testing, and other work required.
   2. Install necessary temporary wiring, panelboards, outlets, switches, lamps, fuses, controls and accessories.

C. Toilets: Maintain adequate number of temporary prefabricated chemical type toilets, unless otherwise indicated, with proper enclosures for use of workers during construction.
   1. Locate toilets where directed.
   2. Keep toilets clean and comply with local and state health requirements and sanitary regulations.
   3. Keep locked during non-working hours.

D. Temporary Heating: Provide temporary heating, including costs of equipment and installation, fuel and attendance, whenever and for such for periods as heating may be required.
   1. General weather conditions to prevent freezing.
   2. Maintain suitable working conditions.
   3. Ensure progress of operation within established scheduled time.
   4. Curing of concrete.

E. Communications
   1. Provide DSL phone line or T1 cable line with internet access or wireless cable as an alternative for the duration of the project.

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2. Pay all costs for installation, maintenance, and removal of the telephone and internet service and instruments, including cellular phone service. The monthly cost of all calls made and received by the CONTRACTOR and subcontractors, including long distance calls, shall be paid for by the CONTRACTOR for the duration of the project.

END OF SECTION 01500

SECTION 01501

CONTROL OF WORK

PART 1- GENERAL

1.01 PLANT

A. The CONTRACTOR shall furnish personnel and equipment which will be efficient, appropriate and large enough to secure a satisfactory quality of work and a rate of progress which will ensure the completion of the work within the time stipulated in the Contract. If any time such personnel appears to the ENGINEER to be inefficient, inappropriate or insufficient for securing the quality of work required or for producing the rate of progress aforesaid, he may order the CONTRACTOR to increase the efficiency, change the character or increase the personnel and equipment, and the CONTRACTOR shall conform to such order. Failure of the ENGINEER to give such order shall in no way relieve the CONTRACTOR of his obligations to secure the quality of the work and rate of progress required.

1.02 PRIVATE LAND

A. The CONTRACTOR shall not enter or occupy private land outside of easements, except by permission of the OWNER.

1.03 PIPE LOCATIONS

A. Pipelines shall be located substantially as indicated on the Drawings, but the ENGINEER reserves the right to make such modifications in locations as may be found desirable to avoid interference with existing structures or for other reasons. Where fittings are noted on the Drawings, such notation is for the CONTRACTOR's convenience and does not relieve him from laying and jointing different or additional items where required.

1.04 OPEN EXCAVATIONS

A. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons, and damage to property. The CONTRACTOR shall, at their own expense, provide suitable and safe bridges and other crossings for accommodating travel by pedestrians and workmen. Bridges provided for access to private property during construction shall be removed when no longer required. The length of open trench will be controlled by the particular surrounding conditions but shall always be confined to the limits prescribed by the ENGINEER. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, the ENGINEER may require special construction procedures such as limiting the length of open trench, prohibiting stacking excavated material in the street, and requiring that the trench shall not remain open overnight.

B. The CONTRACTOR shall take precautions to prevent injury to the public due to open trenches. All trenches, excavated material, equipment, or other obstacles which could be dangerous to the public shall be well lighted at night.

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1.05 TEST PITS

A. Test pits for the purpose of locating underground pipeline or structures in advance of the construction shall be excavated and backfilled by the CONTRACTOR as required to complete the work and/or at the direction of the ENGINEER. Test pits shall be backfilled immediately after their purpose has been satisfied and the surface restored and maintained in a manner satisfactory to the ENGINEER.

1.06 MAINTENANCE OF TRAFFIC

A. The CONTRACTOR shall always maintain roadways for emergency vehicles and for deliveries within the area of construction.

1.07 CARE AND PROTECTION OF PROPERTY

A. The CONTRACTOR shall be responsible for the preservation of all public and private property and use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work on the part of the CONTRACTOR, the CONTRACTOR shall restore such property to a condition similar or equal to that existing before the damage was done, or make good the damage in other manner acceptable to the ENGINEER.

1.08 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES

A. The CONTRACTOR shall assume full responsibility for the protection of all buildings, structures, and utilities, public or private, including poles, signs, services to buildings, utilities in the street, gas pipes, water pipes, hydrants, sewers, drains and electric and telephone cables, whether or not they are shown on the Drawings. The CONTRACTOR shall carefully support and protect all such structures and utilities from injury of any kind. Immediately repair any damage resulting from the construction operations.

B. Assistance will be given to the CONTRACTOR in determining the location of existing services. The CONTRACTOR, however, shall bear full responsibility for obtaining all locations of underground structures and utilities (including existing water services, drain, and sewers). The CONTRACTOR shall maintain services to buildings and pay costs or charges resulting from damage thereto.

C. The CONTRACTOR shall notify all utility companies in writing at least 72 hours (excluding Saturdays, Sundays and Legal holidays) before excavating in any public way.

D. If, in the opinion of the ENGINEER, permanent relocation of a utility owned by the OWNER is required, the ENGINEER may direct the CONTRACTOR, in writing, to perform the work. Work so ordered will be paid for at the Contract unit prices or through an agreed upon change order.

E. Along the proposed pipelines as indicated on the plans, the CONTRACTOR shall remove the surface materials only to such widths as will permit a trench to be excavated which will afford sufficient room for proper efficiency and proper

construction. All applicable regulations shall be followed. Where sidewalks, driveways, pavements, and curb and gutter are encountered, care shall be taken to protect against fracture or disturbance beyond reasonable working limits. All fractured, broken, or disturbed surfaces shall be restored to their original condition prior to completion of the work.

F. Restoration of the site shall be as shown on the Drawings.

G. Lawn areas shall be left in as good or better condition as before starting the work. Where sod is to be removed, it shall be carefully restored with new sod of the same type. Solid sodding shall be placed on all slopes greater than 4:1, within 10 feet of all proposed structures and where existing sod is removed or disturbed by the work. In addition, CONTRACTOR shall restore all storm drains, culverts, inlets, and storm manholes to equal or better condition.

H. Any fence, or part thereof, that is damaged or removed during the course of the work shall be replaced or repaired by the CONTRACTOR and shall be left in as good a condition as before the starting of the work. The manner in which the fence is repaired and replaced, and the materials used shall be subject to the approval of the ENGINEER and/or OWNER.

I. All trees and shrubs not shown to be removed on the plans shall be protected by the CONTRACTOR at their expense. No excavated materials shall be placed so as to injure such trees and shrubs. Trees or shrubs destroyed by negligence of the CONTRACTOR,their employees, or their subcontractor(s) shall be replaced by the CONTRACTOR with new stock of similar size and age at the sole expense of the CONTRACTOR.

1.09 POTABLE WATER FOR CONSTRUCTION PURPOSES

A. The CONTRACTOR will be allowed to use potable water without charge for construction purposes.

B. Water for use in water tightness testing shall be provided to the CONTRACTOR free of charge but the necessary piping and or appurtenances to provide water shall be provided by the CONTRACTOR. The CONTRACTOR will be required to coordinate with the SJCUD on the rate and times for filling structures to not cause low pressure demands in the system.

1.10 CLEANUP AND DISPOSAL OF EXCESS MATERIAL

A. During the course of the work, the CONTRACTOR shall keep the site of operations as clean and neat as possible. The CONTRACTOR shall dispose of all residue resulting from the construction work and, after the work, remove and haul away any surplus excavation, broken pavement, lumber, equipment, temporary structures, and any other refuse remaining from the construction operations and leave the entire site of the work in a neat and orderly condition.

B. To prevent environmental pollution arising from the construction activities related to the performance of this Contract, the CONTRACTOR shall comply with all applicable Federal, State and local laws and regulations concerning waste material disposal, as

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well as the specific requirements stated in this Section and in other related sections.

C. Disposal of excess excavated material in wetlands, stream corridors and plains is strictly prohibited even if the permission of the property OWNER is obtained. Any violation of this restriction by the CONTRACTOR or any person employed by him will be brought to the immediate attention of the responsible regulatory agencies, with a request that appropriate action be taken against the offending parties. The CONTRACTOR will be required to remove the fill and restore the area impacted at no increase in the Contract Price.

1.11 GRADES, SURVEY LINES, AND PROTECTION OF MONUMENTS

A. All work shall be constructed in accordance with the lines and grades shown on the drawings. The full responsibility for keeping alignment and grade shall rest upon the CONTRACTOR.

B. Benchmarks and base line controlling points shall be established prior to beginning work. Reference marks for lines and grades as the work progresses will be located to cause as little inconvenience to the prosecution of the work as possible. The CONTRACTOR shall so place excavation and other materials as to cause no inconvenience in the use of the reference marks provided. CONTRACTOR shall remove any obstructions placed contrary to this provision.

C. The CONTRACTOR shall furnish and maintain, at their own expense, stakes and other such materials and give such assistance, including qualified helpers, for setting reference marks to the satisfaction of the ENGINEER. The CONTRACTOR shall check reference marks by such means, as he/her may deem necessary. The CONTRACTOR shall, at their own expense, establish all working or construction lines and grades as required from the reference marks and shall be solely responsible for the accuracy thereof.

D. Property corners and survey monuments shall be preserved using care not to disturb or destroy them. If a property corner or survey monument is disturbed or destroyed during construction, whether by accident, careless work, or required to be disturbed or destroyed by construction work, said property corner or survey monument shall be restored by a land surveyor registered in the state of Florida. All costs for this work shall be paid for by the CONTRACTOR.

PART 2- PRODUCTS

(NOT USED)

PART 3- EXECUTION

3.01 COOPERATION WITHIN THIS CONTRACT

A. All firms or persons authorized to perform any work under this Contract shall cooperate with the CONTRACTOR and their subcontractors or trades, and shall assist in

incorporating the work of other trades where necessary or required.

B. Cutting and patching, drilling and fitting shall be carried out where required by the trade or subcontractor having jurisdiction, unless otherwise indicated herein or directed by the ENGINEER.

3.02 PROTECTION OF CONSTRUCTION AND EQUIPMENT

A. All newly constructed work shall be carefully protected from injury in any way. No wheeling or walking or placing of heavy loads on it shall be allowed and all portions injured shall be reconstructed by the CONTRACTOR at their own expense.

B. All structures shall be protected in a manner approved by the ENGINEER. Should any of the floors or other parts of the structures become heaved, cracked or otherwise damaged, all such damaged portions of the work shall be completely repaired and made good by the CONTRACTOR at their own expense and to the satisfaction of the ENGINEER. If, in the final inspection of the work, any defects, faults or omissions are found, the CONTRACTOR shall cause the same to be repaired or removed and replaced by proper materials and labor required. Further, the CONTRACTOR shall be fully responsible for the satisfactory maintenance and repair of the construction and other work undertaken herein, for at least the guarantee period described in the contract.

C. Further, the CONTRACTOR shall take all necessary precautions to prevent damage to any structure due to water pressure during and after construction and until such structure is accepted and taken over by the OWNER.

END OF SECTION 01501

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SECTION 01580

PROJECT IDENTIFICATION AND SIGNS

PART 1 – GENERAL

1.01 REQUIREMENTS

A. Furnish, install and maintain project identification sign.

B. Remove sign on completion of construction.

C. Allow no other signs to be displayed.

1.02 SUBMITTALS

A. Submit in accordance with the requirements of Section 01300.

1.03 PROJECT IDENTIFICATION SIGN

A. One painted sign, of not less than 32 square feet (3 square meters) and with painted graphic content to include:
   1. Title of project (4-inch letters): North Beach Water Treatment Plant
   2. Name of OWNER (4-inch letters): St. Johns County Utility Department
   3. Name of ENGINEER (3-inch letters): Design Engineer – Mott MacDonald
   4. Name of CONTRACTOR (3-inch letters)
   5. Name of major subcontractors (2-inch letters)

B. The CONTRACTOR shall coordinate with ENGINEER to obtain the OWNER's and ENGINEER's logos.

C. Graphic design, style of lettering and colors: as approved by the OWNER and ENGINEER and subject to the approval of the local community appearance board or its equivalent and applicable local regulations for signs.

D. The CONTRACTOR shall erect on the site at a lighted location of high visibility and adjacent to the main entrance to site as approved by OWNER.

1.04 INFORMATIONAL SIGNS

A. Painted signs with painted lettering, or standard products.
   1. Size of signs and lettering: as required by regulatory agencies, or as appropriate to usage.
   2. Colors: as required by regulatory agencies, otherwise of uniform colors throughout Project.

B. Erect at appropriate location to provide required information.

1.05 QUALITY ASSURANCE

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A. Sign Painter: Professional Experience in type of work required.

B. Finishes, Painting: Adequate to resist weathering and fading for scheduled construction period.

PART 2 – PRODUCTS

2.01 SIGN MATERIALS

A. Structure and Framing: May be new or used, wood or metal, in sound condition structurally adequate to work and suitable for specified finish.

B. Sign Surfaces: Exterior softwood plywood with medium density overlay, standard large sizes to minimize joints.
   1. Thickness: As required by standards to span framing members, to provide even, smooth surface without waves or buckles.

C. Rough Hardware: Galvanized

D. Paint: Exterior quality, as specified in Division 9.
   1. Use bulletin colors for graphics.
   2. Colors for structure, framing, sign surfaces and graphics: As selected by the ENGINEER.

PART 3 – EXECUTION

3.01 PROJECT IDENTIFICATION SIGN

A. Paint exposed surfaces of supports, framing and surface material; one coat of primer and one coat of exterior paint.

B. Paint graphics in styles, sizes and colors selected.

3.02 MAINTAINENCE

A. Maintain signs and supports in a neat, clean condition; repair damages to structure, framing or sign.

3.03 REMOVAL

A. Remove signs, framing, supports and foundations at completion of project.

END OF SECTION 01580

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SECTION 01600

DELIVERY, STORAGE, AND HANDLING

PART 1- GENERAL

1.01 SCOPE OF WORK

A. This Section specifies the general requirements for the delivery handling, storage and protection for all items required in the construction of the work. Specific requirements, if any, are specified with the related item.

1.02 TRANSPORTATION AND DELIVERY

A. Transportation and handling shall be in accordance with MANUFACTURER's instructions.

B. The CONTRACTOR shall schedule delivery to reduce long term on-site storage prior to installation and/or operation. Under no circumstances shall equipment be delivered to the site more than two months prior to installation without written authorization from the ENGINEER. Should equipment (anything with a motor, electrical, and instrumentation) need to be stored longer than two months, an approved climate-controlled storage unit shall be provided by the CONTRACTOR at no additional cost to the OWNER.

C. CONTRACTOR shall coordinate with OWNER and ENGINEER on pre-purchased equipment and storage requirements. The CONTRACTOR will be responsible for unloading and storage of all equipment including that equipment pre-purchased by the OWNER.

D. The CONTRACTOR shall coordinate delivery with installation to ensure minimum holding time for items that are hazardous, flammable, easily damaged or sensitive to deterioration.

E. Products shall be delivered to the site in MANUFACTURER's original sealed containers or other packing systems, complete with instructions for handling, storing, unpacking, protecting and installing.

F. All items delivered to the site shall be unloaded and placed in a manner which will not hamper the CONTRACTOR's normal construction operation or those of subcontractor and other CONTRACTORs and will not interfere with the flow of necessary traffic.

G. The CONTRACTOR shall provide necessary equipment and personnel to unload all items delivered to the site.

H. The CONTRACTOR shall promptly inspect shipment to assure that products comply with requirements, quantities are correct, and items are undamaged. For items furnished by others (i.e. OWNER, other CONTRACTORs), perform inspection in the presence of the OWNER’s Representative. Notify ENGINEER verbally, and in writing, of any problems.

I. If any item has been damaged, such damage shall be repaired at no additional cost

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to the OWNER.

1.03 STORAGE AND PROTECTION

A. The CONTRACTOR shall store and protect products in accordance with the MANUFACTURER's instructions, with seals and labels intact and legible. Storage instruction shall be studied by the CONTRACTOR and reviewed with the OWNER's Representative by him/her. Instruction shall be carefully followed and a written record of this kept by the CONTRACTOR. Arrange storage to permit access for inspection.
   1. CONTRACTOR shall coordinate with OWNER and ENGINEER on pre-purchased equipment.

B. The CONTRACTOR shall store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

C. Cement and lime shall be stored under a roof and off the ground and shall be kept completely dry at all times. All structural, miscellaneous and reinforcing steel shall be stored off the ground or otherwise to prevent accumulations of dirt or grease and in a position to prevent accumulations of standing water and to minimize rusting. Beams shall be stored with the webs vertical. Precast concrete shall be handled and stored in a manner to prevent accumulations of dirt, standing water, staining, chipping or cracking. Brick, block and similar masonry products shall be handled and stored in a manner to reduce breakage, cracking and spalling to a minimum.

D. All mechanical and electrical equipment and instruments shall be stored in a weather tight building to prevent injury. The building may be a temporary structure on the site or elsewhere, but it must be satisfactory to the OWNER's Representative. Building shall be provided with adequate ventilation to prevent condensation. Maintain temperature and humidity within range required by MANUFACTURER.
   1. CONTRACTOR to coordinate with OWNER on maintenance methods for all pre-purchased equipment.
   2. All equipment shall be stored fully lubricated with oil, grease and other lubricants unless otherwise instructed by the MANUFACTURER.
   3. Moving parts shall be rotated a minimum of once weekly to ensure proper lubrication and to avoid metal-to-metal "welding". Upon installation of the equipment, the CONTRACTOR shall start the equipment, at least half load, once weekly for an adequate period of time to ensure that the equipment does not deteriorate from lack of use.
   4. Lubricants shall be changed upon completion of installation and as frequently as required thereafter during the period between installation and acceptance. New lubricants shall be put into the equipment at the time of acceptance.
   5. Prior to acceptance of the equipment, the CONTRACTOR shall have the MANUFACTURER inspect the equipment and certify that its condition has not been detrimentally affected by the long storage period. Such certifications by the MANUFACTURER shall be deemed to mean that the equipment is judged by the MANUFACTURER to be in a condition equal to that of equipment that has been shipped, installed, tested and accepted in a minimum time period.

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As such, the MANUFACTURER will guaranty the equipment equally in both instances. If such a certification is not given, the equipment shall be judged to be defective. It shall be removed and replaced at the CONTRACTOR's expense.

E. All paint and other coating products shall be stored in areas protected from the weather. Follow all storage requirements set forth by the pain and coating MANUFACTURER's.

END OF SECTION 01600

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SECTION 01700

CONTRACT CLOSEOUT

PART 1- GENERAL

1.01 REQUIREMENTS INCLUDED

A. Comply with requirements stated in Conditions of the Contract and in Specifications for administrative procedures in closing out the Work.

B. The CONTRACTOR shall be required to complete all close out documentation requirements to the satisfaction of the OWNER and ENGINEER.

1.02 RELATED REQUIREMENTS

A. Conditions of the Contract. Fiscal provisions, legal submittals and additional administrative requirements.

B. Section 1050: Project Controls (Surveying)

C. Section 01390: Construction Photographs and Videotaping

D. Section 01710: Cleaning

E. Section 01720: Project Record Documents

F. Section 01730: Operating and Maintenance Data

G. Section 01740: Warranties

H. The respective sections of Specifications: Closeout Submittals Required of Trades.

1.03 CONTRACTOR'S CLOSEOUT SUBMITTALS TO ENGINEER

A. Evidence of compliance with requirements of governing authorities.

B. Project Record Documents: Refer to requirements of Section 01720.

C. Operating and Maintenance Data, Instructions to Owner's Personnel: Refer to requirements of Section 01730.

D. Warranties: Refer to requirements of Section 01740.

E. Spare parts and maintenance materials: Refer to requirements of Section 01730.

F. Evidence of Payment and Release of Liens: Refer to requirements of General and Supplementary Conditions.

G. Certificate of insurance for products and completed operations.

H. Final schedule of asset data as per Section 01370.

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SECTION 01700

CONTRACT CLOSEOUT

1.04 FINAL ADJUSTMENT OF ACCOUNTS

A. Submit a final statement of accounting to the ENGINEER.

B. Statement shall reflect all adjustments to the Contract Sum:
   1. The original Contract Sum.
   2. Additions and deductions resulting from:
      a. Previous Change Orders
      b. Allowances
      c. Unit Prices
      d. Deductions for uncorrected Work
      e. Penalties and Bonuses
      f. Deductions for liquidated damages
      g. Deductions for reinspection payments
      h. Other adjustments
   3. Total Contract Sum, as adjusted.
   4. Previous payments.
   5. Sum remaining due.

C. ENGINEER will prepare a final Change Order, reflecting approved adjustments to the Contract Sum which were not previously made by Change Orders.

1.05 FINAL APPLICATION FOR PAYMENT

A. CONTRACTOR shall submit the final Application for Payment in accordance with procedures and requirements stated in the Conditions of the Contract.

1.06 FINAL CLEANING

A. Refer to Section 01710 for final cleaning requirements.

1.07 FINAL SURVEY

A. In addition to monthly surveys completed for the project, a final as-built survey shall be completed by a land surveyor registered in the state of Florida. This survey shall be provided to the OWNER and ENGINEER for review and comment prior to final acceptance.

1.08 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

END OF SECTION 01700

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SECTION 01710

CLEANING

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Execute cleaning, during progress of the Work, and at completion of the Work, as required by the DBIA Agreement Documents.

1.02 RELATED REQUIREMENTS

A. Conditions of the Contract.

B. Each Specification Section: Cleaning for specific products or work.

1.03 DISPOSAL REQUIREMENTS

A. Conduct cleaning and disposal operations to comply with codes, ordinances, regulations, and anti-pollution laws.

PART 2- PRODUCTS

2.01 MATERIALS

A. Use only those cleaning materials which will not create hazards to health or property, and which will not damage surfaces.

B. Use only those cleaning materials and methods recommended by manufacturer of the surface material to be cleaned.

C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3- EXECUTION

3.01 DURING CONSTRUCTION

A. Execute periodic cleaning to keep the Work, the site and adjacent properties free from accumulations of waste materials, rubbish and windblown debris, resulting from construction operations.

B. Provide on-site containers for the collection of waste materials, debris, and rubbish.

C. Remove waste materials, debris, and rubbish from the site periodically and dispose of at legal disposal areas away from the site.

3.02 DUST CONTROL

A. Clean interior spaces, piping, and equipment prior to the start of finish painting and continue cleaning on an as needed basis until painting is finished.

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B. Schedule operations so that dust and other contaminants resulting from cleaning process will not fail on wet or newly coated surfaces.

3.03 FINAL CLEANING

A. Employ skilled workmen for final cleaning.

B. CONTRACTOR shall complete final cleaning prior to submittal of the final application for payment.

C. Complete the following cleaning operations:
   1. Remove labels that are not permanent labels
   2. CONTRACTOR shall clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compound and other substances that are noticeable vision obscuring materials. Replace chipped or broken glass and other transparent materials.

D. Clean exposed exterior and interior hard-surfaces, finishes to dust-free conditions, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective conditions. Leave concrete floors broom clean. Vacuum carpeted surface.

E. The CONTRACTOR shall wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.

F. Clean the site, including landscape development areas of rubbish, litter and other foreign substances. Sweep paved areas broom clean, remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted to a smooth even-textured surface.

G. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight exposed interior and exterior surfaces.

H. Wash and shine glazing and mirrors.

I. Polish glossy surfaces to a clear shine.

J. Ventilating Systems:
   1. Clean permanent filters and replace disposable filters if units were operated during construction.
   2. Clean ducts, blowers, and coils if units were operated without filters during construction.

K. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds.

L. Prior to final completion, or OWNER occupancy, CONTRACTOR shall conduct an inspection of sight exposed interior and exterior surfaces, and all work areas, to verify that the entire Work is clean.

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SECTION 01710

CLEANING

END OF SECTION 01710

SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1- GENERAL

1.01 REQUIREMENTS INCLUDED

A. Maintain at the site for the OWNER and ENGINEER one record copy of:
   1. Drawings
   2. Specifications
   3. Change orders and other modifications to the Contract
   4. OWNER's field orders or written instructions
   5. Approved shop drawings, working drawings, and samples
   6. Field test records
   7. Construction photographs
   8. All applicable permits

1.02 RELATED REQUIREMENTS

A. Section 01050: Project Controls (Surveying)

B. Section 01300: Submittals

C. Section 01370: Operation and Maintenance Data

1.03 MAINTENANCE OF DOCUMENTS AND SAMPLES

A. Store documents and samples in CONTRACTOR’s field office apart from documents used for construction.
   1. Provide files and racks for storage of documents.
   2. Provide locked cabinet or secure storage space for storage of samples.

B. File documents and samples in accordance with Construction Specifications Institute (CSI) format.

C. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.

D. Make documents and samples available at all times for inspection by the ENGINEER.

E. As a prerequisite for monthly progress payments, the CONTRACTOR is to exhibit the currently updated "record documents" for review by the ENGINEER and the OWNER.

1.04 RECORDING

A. Provide felt tip marking pens for recording information in “Red”.

B. Label each document "PROJECT RECORD" in neat large printed letters.

C. Record information concurrently with construction progress.

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1. Do not conceal any work until required information is recorded.

D. Drawings: Legibly mark to record actual consideration:
   1. Depths of various elements of foundation in relation to finish first floor datum.
   2. All underground piping with elevations and dimensions. Changes to piping location. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements. Actual installed pipe material, class, etc.
   3. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure (this includes electrical conduits).
   4. Field changes of dimension and detail.
   5. Changes made by RFIs, field orders, or by change orders.
   6. Details not on original contract drawings.
   7. Equipment and piping relocations.
   8. Major architectural and structural changes including relocation of doors, windows, etc.
   9. Architectural schedule changes according to CONTRACTOR's records and shop drawings.
   10. Locations, elevations, sizes, types and materials of all manholes (including pipe invert, manhole rim, and bottom elevations), valves, water and sewer services, fire hydrants and all associated structures, hose bibbs, and fittings.
   11. With reference to electrical work the exact routing of conduit runs shall be shown on these drawings.
   12. A final as-built survey shall be completed by a land surveyor registered in the state of Florida. This survey shall be provided to the OWNER and ENGINEER for review and comment prior to final acceptance.

1.05 SUBMITTAL

A. At Contract closeout, deliver record documents to the ENGINEER for the OWNER. The information submitted by the CONTRACTOR into the record drawings and record documents will be assumed to be correct, and the CONTRACTOR shall be responsible for the accuracy of such information, and shall bear the costs resulting from the correction of incorrect data. -out, deliver

B. Accompany submittal with transmittal letter in duplicate, containing:
   1. Date
   2. Project title and number
   3. Contractor's name and address
   4. Title and number of each record document
   5. Signature of CONTRACTOR or their authorized representative

C. Delivery of record drawings and record documents to the OWNER shall be submitted no later than Substantial Completion. Delivery of record files is a prerequisite to final payment.

END OF SECTION 01720

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SECTION 01730

OPERATING AND MAINTENANCE DATA

PART 1- GENERAL

1.01 REQUIREMENTS INCLUDED

A. Compile product data and related information appropriate for OWNER's maintenance and operation of products furnished under this Contract.
   1. Prepare operating and maintenance data as specified in this Section and as referenced in other pertinent sections of Specifications.
   2. Provide one hard copy and an electronic copy of the manuals for final submittals.

B. Instruct OWNER's personnel in maintenance of products and in operation of equipment and systems.

1.02 RELATED REQUIREMENTS

A. Section 01300: Submittals

B. Section 01700: Contract Closeout

C. Section 01720: Project Record Documents

D. Section 01740: Warranties

1.03 QUALITY ASSURANCE

A. Preparation of data shall be done by personnel:
   1. Trained and experienced in maintenance and operation of described products.
   2. Familiar with requirements of this Section.
   3. Skilled as technical writer to the extent required to communicate essential data.
   4. Skilled as draftsman competent to prepare required drawings.

1.04 OPERATING MANUALS

A. The VENDOR shall provide operation and maintenance instructions for all electrical, mechanical, and instrumentation and controls equipment furnished under various technical specifications or as identified in the specific section.

B. Three complete sets of operations and maintenance manuals approved by the ENGINEER covering all equipment furnished under Divisions 8, 10, 11, 13, 14, 15, and 16 shall be delivered at least 30 days prior to scheduled start-up directly to the OWNER.

C. An electronic copy of the manual shall be provided as well as hard copy submittal.

D. Separate manuals shall be provided for each type of equipment, or each Section number. Each manual shall contain the following specific requirements. Manuals that do not meet the requirements shall be rejected and Equipment Supplier/Manufacturer will bear all expenses to resubmit the manual to meet the

following requirements.

E. Manual Format
1. Size: 8 1/2 inches x 11 inches.
2. Paper: 20 pound minimum, white, for typed pages.
3. Text: Manufacturer's printed data, or neatly typewritten.
4. Drawings:
   a. Provide reinforced punched binder tab, bind in with text.
   b. Reduce larger drawings and fold to size of text pages but not larger than 11 inches x 17 inches.
5. Provide fly-leaf for each separate product, or each piece of operating equipment.
   a. Provide typed description of product, and major component parts of equipment.
   b. Provide indexed tabs.
6. Cover: Identify each volume with typed or printed, title "OPERATING AND MAINTENANCE INSTRUCTIONS" List:
   a. Title of Project.
   b. Identity of separate structure as applicable.
   c. Identity of general subject matter covered in the manual.

F. Binders
1. Commercial quality three-post binders with durable and cleanable plastic covers.
2. Maximum post width: 2 inches or as applicable.
3. When multiple binders are used, correlate the data into related consistent groupings.

1.05 CONTENT OF MANUAL

A. Neatly typewritten table of contents for each volume, arranged in systematic order.
1. CONTRACTOR, name of responsible principal, address, and telephone number.
2. A list of each product required to be included, indexed to content of the volume.
3. List, with each product, name, address, email, and telephone number of:
   a. Subcontractor, manufacturer, or installer.
   b. Local manufacturer’s representative
   c. Maintenance contractor, as appropriate.
   d. Identify area of responsibility of each.
   e. Local source of supply for parts replacement.
4. Identify each product by product name and other identifying symbols as set forth in Contract Documents.

B. Product Data
   1. Include only those sheets which are pertinent to the specific product.
   2. Annotate each sheet to:
      a. Clearly identify specific product or part installed
      b. Clearly identify data applicable to installation
      c. Delete references to inapplicable information

C. Drawings
   1. Supplement product data with drawings as necessary to clearly illustrate:
      a. Relations of component parts of equipment and systems.
      b. Control and flow diagrams.
   2. Coordinate drawings with information in project record documents to assure correct illustration of completed installation.
   3. Do not use project record documents as maintenance drawings.

D. Written text, as required to supplement product data for the particular installation:
   1. Organize in consistent format under separate headings for different procedures.
   2. Provide logical sequence of instructions of each procedure.
   3. Copy of each warranty, bond and service contract issued.
   4. Provide information sheet for OWNER's personnel, give:
      a. Proper procedures in event of failure.
      b. Instances which might affect validity of warranties or bonds.

E. Electronic Transmission of O&M Manuals
   1. Electronic O&M manuals shall meet the following conditions:
      a. All other requirements specified above have been met, including, but not limited to, coordination by the CONTRACTOR, review and approval by the CONTRACTOR.
      b. With the exception of the transmittal sheet, the entire submittal is included in a single file.
      c. Files are Portable Document Format (PDF) – with the printing function enabled.
      d. The Vendor provided equipment, sub-system, or system manuals shall be in PDF format, compliant with the Adobe PDF specification (latest version). The manual shall be searchable image. The optical character recognition of the image shall be a 95% confidence level. The manuals shall be linked and bookmarked as follows:
         1) Provide links from all Table of Contents, List of Tables, List of Figures, etc., entries to the actual occurrence in the body of the manual.
         2) Create bookmarks for all linked Table of Contents entries.
      e. All drawings shall be in PDF format, compliant with the Adobe PDF Specification (latest version). The manual shall be PDF Searchable Image. The Optical Character Recognition of the image shall be at a 95% confidence level. The drawings shall be linked as follows:
         1) External links from the Drawing Index (if it exists) to each drawing.
         2) External links from references within drawings to other drawings.
   2. When electronic copies are provided, transmit one hard-copy (paper) original to the ENGINEER.

3. The electronic copy of the O&M manual must be identical in organization, format, and content to the hard copies of the manual.

1.06 EQUIPMENT ATTRIBUTE WORKSHEETS

A. Equipment Attribute Worksheets shall be provided for all equipment meeting the asset definition as follows:
   1. Asset Definition
      a. Maintenance is recommended
      b. Assets have a value greater than $1,000
      c. Assets are complete
   2. This asset definition is intended to give a general indication of which equipment must be included in the Equipment Attribute Worksheets. The ENGINEER will provide the specific list of equipment that the VENDOR must provide information for:
      a. The information requirements are shown in detail in the table. The data requirements include nameplate data, manufacturer and supplier information, information specific to the type of equipment, and recommended preventative maintenance activities.
      b. An electronic copy of the Equipment Attribute Worksheets must be delivered in Excel format and submitted with the O&M manuals. It is not necessary to submit printed copies of the Equipment Attribute Worksheets.

1.07 INSTRUCTION OF OWNER'S PERSONNEL

A. Prior to startup of equipment and facilities, fully instruct OWNER's designated operating and maintenance personnel in operation, adjustment and maintenance of products, equipment, and systems. Refer to individual specifications for training requirements.

B. Operating and maintenance manual shall constitute the basis of instruction.
   1. Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance.

C. Unless specified otherwise under the respective equipment specification section, vendor training/instruction shall consist of eight hours of training for each type of equipment. Such training/instruction shall be scheduled and held at times to accommodate the work schedules of OWNER'S personnel, including splitting the required training/instruction time into separate sessions and/or presented at reasonable times other than the CONTRACTOR's "normal working hours" or the OWNER's normal day shift.

D. At least two weeks prior to the schedule for vendor training, a detailed lesson plan, representative of the material to be covered during instruction, shall be submitted to the ENGINEER for approval. Lesson plans shall consist of in-depth outlines of the training material, including a table of contents, resume of the instructor, materials to be covered, start-up procedures, maintenance requirements, safety considerations, and shut-down procedures.

E. Vendor's training/instruction will be considered acceptable based on the completed *Owner's Acknowledgement of Manufacturer's Instruction* as indicated on the Equipment Manufacturer's Certification of Installation, Testing, and Instruction appended to this Section.

FORM TO FOLLOW

END OF SECTION 01730

SECTION 01730

OPERATING AND MAINTENANCE DATA

EQUIPMENT MANUFACTURER'S CERTIFICATE OF INSTALLATION, TESTING, AND INSTRUCTION

Owner: SJCUD
Project: NORTH BEACH WTP IMPROVEMENTS

Contract No. _____
Mott MacDonald Project No. 502101130-015
EQUIPMENT SPECIFICATION SECTION_____

I_____, Authorized representative of
(Print Name)

_____, hereby certify that
(Print Manufacturer's Name)

_____
(Print equipment name and model with serial No.)

installed for the subject project [has] [have] been installed in a satisfactory manner, [has] [have] been satisfactorily tested, [is] [are] ready for operation, and that Owner assigned operating personnel have been suitably instructed in the operation, lubrication, and care of the unit[s] on

Date: _____

CERTIFIED BY: _____ DATE: _____
(Signature of Manufacturer's Representative)

OWNER'S ACKNOWLEDGMENT OF MANUFACTURER'S INSTRUCTION

[I] [We] the undersigned, authorized representatives of the _____ and/or Plant Operating Personnel have received classroom and hands on instruction on the operation and maintenance of the subject equipment and [am] [are] prepared to assume normal operational responsibility for the equipment:

_____ DATE: _____
_____ DATE: _____
_____ DATE: _____

SECTION 01740

WARRANTIES

PART 1- GENERAL

1.01 REQUIREMENTS INCLUDED

A. Compile specified warranties as per general conditions and per the technical specification requirements.

B. Co-execute submittals when so specified.

C. Review submittals to verify compliance with Contract Documents.

D. Submit to the ENGINEER for review and transmittal to OWNER.

1.02 RELATED REQUIREMENTS

A. SJCUD General and Supplemental Conditions

B. Section 01700: Contract Closeout.

1.03 SUBMITTAL REQUIREMENTS

A. Assemble warranties and service and maintenance contracts, executed by each of the respective manufacturers, suppliers, and SUBCONTRACTORs into a warranty notebook.

B. Number of original signed copies required: Two each.

C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.
   1. Product or work item
   2. Vendor or manufacturer, with name of principal, address and telephone number
   3. Scope
   4. Date of beginning of warranty, bond or service and maintenance contract
   5. Duration of warranty, bond or service maintenance contract
   6. Provide information for OWNER's personnel:
      a. Proper procedure in case of failure
      b. Instances which might affect the validity of warranty
   7. CONTRACTOR, name of responsible principal, address and telephone number

1.04 FORM OF SUBMITTALS

A. Prepare in duplicate packets

B. Format:
   1. Size 8 1/2 inches x 11 inches, punch sheets for standard 3-post binder.1/2 inches x 11 inches, punch sheets for standard 3 post binder.
      a. Fold larger sheets to fit into binders.
   2. Cover: Identify each packet with typed or printed title "WARRANTIES”:

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a. Title of Project
b. Name of CONTRACTOR

C. Binders: Commercial quality, three-post binder, with durable and cleanable plastic covers and maximum post width of 2 inches. Include divider tabs for each warranty item and correlate to the table of contents. -post binder, with durable and cleanable plastic covers and maximum post width of 2 inches.

1.05 WARRANTY SUBMITTAL REQUIREMENTS

A. For all major pieces of equipment, submit a warranty from the equipment manufacturer. The manufacturer's warranty period shall be concurrent with the CONTRACTOR 's for one (1) year commencing at the time of acceptance by the OWNER or as specified in the equipment or material specifications.

B. The CONTRACTOR shall be responsible for obtaining certificates for equipment warranty from the MANUFACTURER for all major equipment specified under Division 11, 13, 14, 15 and 16 and which has a 1 HP motor or which lists for more than $1,000. The ENGINEER reserves the right to request warranties for equipment not classified as major. The CONTRACTOR shall still warrant equipment not considered to be "major" in the CONTRACTOR 's one-year warranty period even though certificates of warranty may not be required.

C. In the event that the equipment manufacturer or supplier is unwilling to provide a one-year warranty commencing at the time of OWNER acceptance, the CONTRACTOR shall obtain from the manufacturer a two (2) year warranty commencing at the time of equipment delivery to the job site. This two-year warranty from the manufacturer shall not relieve the CONTRACTOR of the one-year warranty starting at the time of the OWNER acceptance of the equipment.

END OF SECTION 01740

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SECTION 02050

DEMOLITION AND MODIFICATIONS

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. CONTRACTOR shall furnish all labor, materials, equipment, and incidentals required and demolish, modify, remove, and dispose of work shown on the drawings and as specified herein.

B. Demolition and removal of all electrical items to be removed from service shall be fully coordinated with the approved detailed sequence of construction activities; in no case shall any demolition and removal take place that would result in a loss of any treatment capacity at the Water Treatment Plant. Refer to Section 01014 for detailed sequence of construction activities.

C. Included, but not limited to, are demolition, modifications, and removal of existing materials, equipment or work necessary to install the new work as shown on the drawings and as specified herein and to connect with existing work in an approved manner.

D. Demolition, modifications, and removals which may be specified under other Sections shall also conform to requirements of this Section.

E. CONTRACTOR shall also refer to the contract drawings for limit and extent of demolition.

F. Demolition and modifications include but are not limited to:
   1. Demolition of the existing concrete pads, piping, and appurtenances.
   2. Demolition of existing yard piping, valves, meters, fittings, and appurtenances as indicated on the Drawings and return to OWNER.
   3. Demolition of existing electrical equipment and associated appurtenances as indicated on the contract drawings.
   4. Removal of existing influent pumps, valves, piping, and appurtenances.
   5. Demolition of other appurtenances, equipment, electrical, and piping as reflected on the contract drawings.
   6. Miscellaneous demolition reflected on the demolition sheets including concrete, asphalt and other associated items.

G. Blasting and the use of explosives will not be permitted for any demolition work.

1.02 RELATED WORK

A. Summary of work is included in Section 01010.

B. Sequence of Construction is included in Section 01014.

C. Submittals are included in Section 01300.

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D. Excavation and Backfill is included in Section 02200 and 02221.

1.03 SUBMITTALS

A. Submit, in accordance with Section 01300, copies of proposed methods and operations of demolition of the structures and modifications prior to the start of work. Include in the schedule the coordination of shutoff, capping and continuation of utility service as required.

B. Furnish a detailed sequence of demolition and removal work to ensure the uninterrupted progress of the OWNER's operations. Sequence shall be compatible with sequence of construction and operational requirements as specified in Section 01014 and coordinated with the OWNER.

1.04 JOB CONSTRUCTION

A. Protection

7. Execute the demolition and removal work to prevent damage or injury to structures, occupants thereof and adjacent features which might result from falling debris, vibration, or other causes, and so as not to interfere with the use, occupancy, and free and safe passage to and from adjacent structures. Temporary shoring may be required to safeguard the existing infrastructure while the new yard piping wet well is being constructed. Other areas also likely exist where shoring requirements will be necessary to construct new piping installed in close proximity to existing structures.
8. Maintaining safe access to all necessary existing facilities and operations is a requirement of this job. No work or storage of materials will be permitted that affect operations unless specifically coordinated and approved by the OWNER through its project representatives. A sequence of construction has been developed and included in Section 01014 and reflected on the Drawings.
9. Erect and maintain barriers, lights, additional security fencing, sidewalk sheds and other required protective devices.

B. Scheduling

1. Carry out operations to avoid interference with operations and work in the existing facilities.

C. Notifications

1. At least 72 hours prior to commencement of a demolition or removal, notify the ENGINEER in writing of proposed schedule. OWNER shall inspect the existing equipment and identify and mark those items which are to remain the property of the OWNER. No removals shall be started without the permission of the ENGINEER.

D. Conditions of Structures

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1. The OWNER and the ENGINEER assume no responsibility for the actual condition of the structures to be demolished or modified.
2. Conditions existing at the time of inspection for bidding purposes will be maintained by the OWNER insofar as practicable. However, variations within a structure may occur prior to the start of demolition work. The CONTRACTOR has included in their Guaranteed Maximum Price (GMP) costs and ascertained for themselves the degree of work necessary to work safely during the implementation of the demolition and removal work.

E. Repairs to Damage
1. Promptly repair damage caused to adjacent facilities by demolition operation when directed by ENGINEER and at no additional cost to the OWNER. Repairs shall be made to a condition at least equal to that which existed prior to construction.

F. Traffic Access
1. Conduct demolition and modification operations and the removal of equipment and debris to ensure minimum interference with roads, streets, walks both on-site and off-site and to ensure minimum interference with occupied or used facilities.
2. Special attention is directed towards maintaining safe and convenient access to the existing facilities by plant personnel and plant associated vehicles.
3. Do not close or obstruct streets, walks or other occupied or used facilities without permission from the ENGINEER. Furnish alternate routes around closed or obstructed traffic in access ways. Where work in adjacent roadways is required; submit a Maintenance of Traffic Plan and maintain access to adjacent facilities. All work shall be approved through the SJCUD.

1.05 RULES AND REGULATIONS

A. The building code of the State of Florida shall control the demolition, modification or alteration of existing buildings and structures.

B. No building or structure, or any part thereof, shall be demolished until an application has been filed with the Building Inspector and a permit issued. The fee for this permit shall be the CONTRACTOR's responsibility.

1.06 DISPOSAL OF MATERIAL

A. Salvageable material and equipment identified during construction as to be salvage shall become the property of the OWNER. Dismantle all such items to a size that can be readily handled and deliver them to a designated storage area.

B. The following materials and items of equipment shall remain the property of the OWNER and stored or transferred where directed. Any such material damaged due to improper handling will not be accepted and the replacement value of the material deducted from the payment to the CONTRACTOR. The OWNER reserves the right to retain ownership of any of the existing equipment shown being demolished on the

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drawings, and any such materials shall be returned to the OWNER at their discretion. All items shall be transported to the SJCUD shop located at 2100 Arc Drive in St. Augustine.

1. Standby diesel bypass pumps and piping
2. Meter and valves as indicated by SJCUD
3. Four (4) pump VFDs
4. Ultrasonic level transducer and pump controller
5. During decommissioning of the existing influent pump station RTUs, SJCUD will be on site to identify what should be removed from the RTU cabinet including fiber media converter and power supplies

C. Equipment, materials, and components to be demolished, salvaged, and/or disposed of are designated on the Drawings or described herein. Items to be disposed of by the CONTRACTOR shall become the CONTRACTOR's property and shall be removed from the site at an approved, regulated disposal facility.

1.07 UTILITIES

A. Carry out operations to avoid interference with operations and work in the existing facilities.

B. Do not interrupt existing utilities serving occupied or used facilities, except when authorized by the OWNER. Provide necessary bypass during interruptions to existing utilities as acceptable to the OWNER.

C. Cooperate with the OWNER to shut off utilities serving structures of the existing facilities as required by demolition operations.

D. Be solely responsible for making all necessary arrangements and for performing any necessary work involved with the discontinuance of operations of the existing plant facilities.

1.08 DUST AND NOISE CONTROL

A. Take all measurers necessary to minimize the amount of dust and noise resulting from demolition activity.

B. Use water sprinkling, temporary enclosures, and other suitable methods to limit the amount of dust and dirt rising and scattering in the air to the lowest practical level. Comply with governing regulations pertaining to environmental protection.

1. Do not use water when it may create hazardous or objectionable conditions such as flooding and pollution.
2. Clean adjacent structures, facilities, and improvements of dust, dirt and debris caused by demolition operations. Return adjacent areas to conditions existing prior to the start of the work.

PART 2 – PRODUCTS

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(NOT USED)

PART 3 – EXECUTION

3.01 SEQUENCE OF WORK

A. The sequence of demolition and modifications shall be strictly coordinated with the OWNER and shall comply with the schedule submitted and approved by the OWNER and as per Section 01014.

3.02 GENERAL

A. All materials and equipment removed from existing work shall become the property of the CONTRACTOR, except for those which the OWNER has identified and marked for their use. All materials and equipment marked by the OWNER to be salvaged shall be carefully removed, so as not to be damaged, cleaned and stored on or adjacent to the site in a protected place until they are transported by the CONTRACTOR to the OWNER designated locations.

B. Dispose of all demolition materials, equipment, debris and all other items not marked by the OWNER to remain, off the site and in conformance with all existing applicable laws and regulations.

C. Pollution Controls

1. Use water sprinkling, temporary enclosures and other suitable methods to limit the amount of dust and dirt rising and scattering in the air to the lowest practical level. Comply with governing regulations pertaining to environmental protection.

a. Do not use water when it may create hazardous or objectionable conditions such as flooding and pollution.

b. Clean adjacent structures, facilities, an improvements of dust, dirt and debris caused by demolition operations. Return adjacent areas to conditions existing prior to the start of the work.

D. Building Demolition

1. Unless otherwise approved by ENGINEER, proceed with demolition from the top of the structure to the ground. Complete demolition work above each floor or tier before disturbing supporting members of lower levels.
2. Demolish concrete and masonry in small sections.
3. Remove structural framing members and lower to ground by means of hoists, derricks, or other suitable methods.
4. Break up and remove foundations and slabs-on-grade, unless otherwise shown to remain.
5. Locate demolition equipment throughout the structure and remove material to not impose excessive loads to supporting walls, floors or framing.

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3.03 STRUCTURAL REMOVALS

A. Remove identified structures in their entirety unless otherwise directed by the ENGINEER.

B. Provide adequate shoring of any adjacent structures where demolition of structures may jeopardize the structural integrity of adjacent structures to remain.

3.04 MECHANICAL REMOVALS

A. Mechanical removals shall consist of dismantling and removing of piping pumps, motors, equipment and other appurtenances as specified, shown, or required for the completion of the work. It shall include cutting, capping, and plugging as required, except that the cutting of existing pipe for making connection thereto will be included under Division 15.

B. Existing process, water, chemical, gas, fuel and other piping not required for the new work shall be removed. Chemical and fuel lines and tanks shall be purged and made safe prior to removal.

C. All underground piping shown being demolished shall be removed.

3.05 ELECTRICAL REMOVALS

A. Electrical removals shall consist of the removal of existing transformers, distribution switchboards, control panels, motors, conduits and wires, poles and overhead wiring, panel boards, lighting fixtures and miscellaneous electrical equipment from all structures shown on the Drawings to be removed, specified herein, or required to perform the work. It is the intent of this contract that all subsurface electrical conductors be removed as well.

B. All existing electrical equipment and fixtures to be removed shall be removed with such care as may be required to prevent unnecessary damage, to keep existing systems in operation and to maintain the integrity of the grounding systems.

C. Conduits and wires which are part of the existing electrical and control system and not required for the proposed electrical modifications shall be completely removed by the CONTRACTOR. Conduits concealed in floors, ceiling slabs, or in walls shall be cut flush with slab or wall at the point of entrance and wiring removed. The conduits shall be properly plugged and the area repaired in a flush, smooth, and approved manner. All exposed conduits and their supports shall be disassembled and removed from the site. Repair all areas of work to prevent rust spots on exposed surfaces.

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D. Wiring in the underground duct system and where indicated the duct system itself shall be removed. Verify the function of all wiring before disconnection and removing it. Ducts shall be plugged where they enter buildings and made watertight.

E. Direct-burial cable shall also be removed. Where such cables enter the existing buildings, the cable shall be cut back to the point of entrance. All openings in the building for entrance of abandoned direct-burial cable shall be patched and made watertight.

F. Pole and overhead wiring shall be temporarily or permanently moved or abandoned as shown and specified. Existing poles and overhead conductors owned by the power company will be removed by the power company. Perform this work after the proposed service has been completed and energized, and in accordance with the approved schedule.

G. Lighting fixtures shall be removed and salvaged where requested by the OWNER. Fixtures not salvaged shall be removed from the site and properly disposed.

H. All miscellaneous electrical equipment, shall be removed and disposed of off the site as required including all decommissioned equipment. Care shall be taken in removing all equipment so as to minimize damage to architectural and structural members. Any damages incurred shall be repaired.

3.06 CLEAN-UP

A. Remove from the site all debris resulting from the demolition operations as it accumulates. Upon completion of the work, all materials, equipment, waste and debris of every sort shall be removed and premises shall be left, clean, neat and orderly.

B. Restore and return items intended to remain that have been damaged by demolition work at no cost to the OWNER.

C. Re-grade site and seed or sod area as per the specifications.

END OF SECTION 02050

SECTION 02100

SITE PREPARATION

PART 1- GENERAL

1.01 SCOPE OF WORK

A. This Section covers clearing, grubbing and stripping along and within the construction sites, complete as specified herein.

B. The CONTRACTOR shall clear and grub all of the area within the limits of construction or as required, which includes but is not limited to, rights of ways. The width of the area to be cleared shall be established by the ENGINEER prior to the beginning of any clearing or as shown on the Drawings.

PART 2- PRODUCTS

(NOT USED)

PART 3- EXECUTION

3.01 CLEARING

A. The surface of the ground, for the area to be cleared and grubbed shall be completely cleared of all timber, brush, stumps, roots, grass, weeds, rubbish and all other objectionable obstructions resting on or protruding through the surface of the ground. However, those trees which are designated by the ENGINEER shall be preserved as hereinafter specified. Clearing operations shall be conducted so as to prevent damage to existing structures and installations, and to those under construction, and so as to provide for the safety of employees and others. Clearing for structures shall consist of topsoil and vegetation removal.

3.02 GRUBBING

A. Grubbing shall consist of the complete removal of all stumps, roots larger than 1/2 inches in diameter, matted roots, brush, timber, logs and any other organic or metallic debris not suitable for foundation purposes, resting on, under or protruding through the surface of the ground to a depth of 18 inches below the subgrade. All depressions excavated below the original ground surface for or by the removal of such objects, shall be refilled with suitable materials and compacted to a density conforming to the surrounding ground surface.

3.03 STRIPPING

A. In areas so designated, top soil shall be stockpiled. Topsoil so stockpiled shall be protected until it is placed as specified. Any topsoil remaining after all work is in place shall be disposed of by the CONTRACTOR.

3.04 DEMUCKING, BACKFILLING AND SPECIAL COMPACTION REQUIREMENTS

A. All organic surface soils and muck shall be removed under all structures, tanks, pipes, slabs, roads, and walls, plus a five-foot margin all around.

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B. Refer to the geotechnical report located in **Appendix A** for additional details.

3.05 DISPOSAL OF CLEARED, GRUBBED, AND DEMUCKED MATERIAL

A. The CONTRACTOR shall dispose of all material and debris from the clearing and grubbing operation by hauling such material and debris away to and approved disposal facility. Disposal by burning or burial will not be permitted. The cost of disposal (including hauling) of cleared and grubbed material and debris shall be included in the contract.

B. If the land owner desires the timber or small trees, the CONTRACTOR shall cut and neatly pile it in 4 foot lengths for removal by the land owner; otherwise the CONTRACTOR shall dispose of it by hauling away from the project site.

3.06 PRESERVATION OF TREES

A. Those trees which are designated on the drawings for preservation or protection shall be carefully protected from damage as detailed on the Drawings. The CONTRACTOR shall erect such barricades, guards, and enclosures for the protection of the trees during all construction operations.

3.07 PRESERVATION OF DEVELOPED PRIVATE PROPERTY

A. The CONTRACTOR shall exercise extreme care to avoid unnecessary disturbance of developed private property as applicable. Trees, shrubbery, gardens, lawn and other landscaping, which in the opinion of the ENGINEER must be removed, shall be replaced and replanted to restore the construction easement to the condition existing prior to construction.

B. All soil preparation procedures and replanting operations shall be under the supervision of a nurseryman experienced in such operations.

C. Improvements to the land such as fences, walls, outbuildings, etc., which of necessity must be removed shall be replaced with equal quality materials and workmanship.

D. The CONTRACTOR shall clean up the construction site across developed private property directly after construction is completed upon approval of the ENGINEER.

END OF SECTION 02100

SECTION 02140

DEWATERING

PART 1 – GENERAL

1.01 SUMMARY OF WORK

A. Any dewatering required to perform and complete the work under this Contract is the sole responsibility of the CONTRACTOR and no additional payment will be made. Any dewatering operation(s), overtime, equipment rental or any and all other expenses/costs related to dewatering shall be borne solely by the CONTRACTOR.

B. Dewatering will be required for some structures and piping that extend below existing grade. More detailed information on expected groundwater levels to be taken into consideration for the dewatering plan are contained in the geotechnical report provided in **Appendix A**.

1.02 RELATED WORK

A. Section 02220 – Excavating, Backfilling, and Grading for Structures

B. Section 02221 – Trenching, Bedding, and Backfilling for Pipes

1.03 SUBMITTALS

A. Provide a dewatering plan in accordance with Section 01300 which addresses the dewatering activities to be employed by the CONTRACTOR of each structure and yard piping.

PART 2 – PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. The CONTRACTOR shall furnish all materials and equipment necessary to carry out all dewatering required to perform and complete all work under this contract.

PART 3 – EXECUTION

3.01 GENERAL

A. At all times, the CONTRACTOR is to maintain and operate proper and adequate surface and subsurface dewatering in order to keep the construction site dry and in such condition that construction of structures and utilities and placement and compaction of fill and backfill may proceed unhindered by saturation of the area. The CONTRACTOR shall maintain existing drainage at all times to allow for unimpeded, continuous drainage. Any temporary drainage shall be done in such a manner as to NOT impact existing structures, surface waters, existing drainage or construction operations in an adverse manner as determined by the ENGINEER. quate surface and subsurface dewatering in order to keep the construction site dry and in such condition that construction of structures and utilities and placement and compaction of fill and backfill may proceed unhindered by saturation of the area.

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B. The CONTRACTOR is to prevent surface water and subsurface or groundwater from flooding or spilling into excavations, and from flooding the project site or surrounding area. CONTRACTOR is to remove all water in order to prevent softening of structure or pipe foundation bottoms, undercutting footings, and creating soil consistency changes detrimental to the stability of sub grades and foundations. The CONTRACTOR is further to provide and maintain pumps, well points, sumps, suction and discharge lines, or other dewatering system components necessary to convey all water away from excavations.

C. The CONTRACTOR is to obtain, at his own cost, any permits required for construction dewatering.

D. Any and all discharges shall be in compliance with local, state and federal laws, regulations and guidelines including FAC Chapter 62-621.300. All water collected from construction activities shall be contained on site and disposed of either in the sanitary or storm sewer systems. The CONTRACTOR shall obtain any required permits related to dewatering, and no separate payment for permit fees will be made.

E. Construction is in a sensitive area with residences surrounding it. CONTRACTOR shall discuss any and all discharges with the OWNER and ENGINEER prior to proceeding with permits and actual discharge operations. No discharges shall be allowed without the required permits approved and on site. Furnish a copy of all permits to OWNER and ENGINEER for their records.

F. Where dewatering will occur in the vicinity of structures, the CONTRACTOR shall monitor for adverse effects to structures or wells due to dewatering and shall be responsible to remedy same to the satisfaction of the State and/or authorities having jurisdiction. Discharges from dewatering activities which contain silt or hydrogen sulfide are subject to the following controls:

1. All discharges from dewatering activities to surface waters, wetlands or storm sewers shall be free of sediments. Care shall be taken not to damage or kill vegetation by excessive watering or by damaging silt accumulation in the discharge area. If discharges are sediment laden, techniques shall be employed to remove sediment prior to discharge. A sedimentation basin shall be constructed and used where necessary, to protect vegetation and to achieve environmental objectives.
2. Sewer inlets within construction areas shall be protected with perimeter hay bales or with other approved inlet protection as approved by the ENGINEER or OWNER.

END OF SECTION 02140

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SECTION 02220

EXCAVATING, BACKFILLING, AND GRADING FOR STRUCTURES

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. This Section includes excavation, filling, and grading to attain the subgrades and grades indicated on the Drawings.

B. Supplemental foundation and site preparation notes are indicated on the Drawings.

C. Provide the services of a licensed professional ENGINEER registered in the State of Florida to prepare temporary excavation support system designs and submittals.

D. Furnish and install temporary excavation support systems, including sheeting, shoring and bracing, to ensure the safety of personnel and protect adjacent structures, piping, etc., in accordance with Federal, State and local laws, regulations, and requirements.

E. Furnish and install temporary dewatering and surface water control systems and operate to dewater and maintain in a dry condition. Control drainage into excavations and remove seepage water and rainwater.

F. All excavation and backfill for structures, utilities, and pavements shall be performed in accordance with the Contract Documents, Drawings, and Geotechnical Engineering report provided in **Appendix A**. The CONTRACTOR shall be responsible for evaluating subsurface conditions and performing the Work in accordance with the Contract Documents. Where discrepancies exist between this Specification and the referenced geotechnical report, the referenced geotechnical report shall take precedence if more restrictive.

G. The CONTRACTOR shall be responsible for calculating the required cut and fill calculations for the entire site. All new fill or reuse of soils on the site for fill shall meet the requirements of Sections 02220 and 02221.

H. The "footprint" of the proposed building plus a minimum additional margin of 5 feet, and of the hardscape areas (parking/driveway) plus a minimum additional margin of 3 feet, should be stripped of all surface vegetation, stumps, debris, organic topsoil, or other deleterious materials. During grubbing operations, roots with a diameter greater than 0.5-inch, stumps, or small roots in a concentrated state, should be grubbed and completely removed. After completing clearing and stripping, the exposed surface should be compacted with a vibratory drum roller. Compaction should continue until densities of at least 95 percent of the modified Proctor maximum dry density (ASTM D 1557) have been achieved within the upper one foot of the compacted natural soils at the site. Structural fill is defined as a non-plastic, inorganic, granular soil having less than 10 percent material passing the No. 200 mesh sieve and containing less than 4 percent organic material. The fine sand and fine sand with silt or fine sand with clay, without roots, as encountered in the borings, are suitable as fill materials and, with proper moisture control, should densify using conventional compaction methods. Soils with more than 10 to 12 percent passing the No. 200 sieve will be more difficult to compact, due to their nature to retain soil

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moisture, and may require drying. Materials satisfactory for use as structural fill should consist of soils with the following compaction requirements:

1. Compaction standard: Modified Proctor, ASTM D1557
2. Required Compaction:
   a. 95% of Max. Dry Density (general structural fill)
   b. 98% of Max. Dry Density (upper one foot below the proposed flexible pavement base course)
3. Loose Thickness Prior to Compaction
   a. 12 inches if vibratory drum roller compaction equipment is used
   b. 8 inches if vibratory drum roller is used in static mode
   c. 8 inches if track-mounted compaction equipment is used
   d. 6 inches if hand-held compaction equipment is used

I. The cost for this excavation, stockpiling, dewatering, loading, hauling, and disposal of any unsuitable material outlined as expected in the geotechnical report has been included in the CONTRACTOR’s Guaranteed Maximum Price (GMP).

1.02 RELATED WORK

A. Section 01410: Testing and Testing Laboratory Services

B. Section 02100: Site Preparation

C. Section 02140: Dewatering

D. Section 02221: Trenching Bedding and Backfill for Pipe

1.03 QUALITY ASSURANCE

A. Codes and Standards: Perform excavation work in compliance with applicable requirements of the governing authorities having jurisdiction.

B. Testing and Inspection Service:
   1. The CONTRACTOR shall engage soil testing and inspection service for quality control testing during earthwork operations. See Section 01410 for additional details.

C. All excavation, trenching, sheeting, bracing shall comply with the requirements of OSHA excavation safety standards (29 CFR Part 1926.650 Subpart P), State of Florida “Trench Safety Act” (Part IV, Chapter 553 of the Florida Statutes) and local requirements. Where conflict between OSHA, State and local requirements exists, the most stringent requirements shall apply.

1.04 SUBMITTALS

A. Excavation support system designs shall be prepared by a licensed professional ENGINEER, registered in the State of Florida having a minimum of 5 years of professional experience in the design and construction of excavation support systems. CONTRACTOR shall submit an original and three copies of the licensed professional ENGINEER's certification, on the PE form specified in Section 01300, stating that the excavation support systems designs have been prepared by the

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professional ENGINEER and that the professional ENGINEER will be responsible for their execution. Do not submit excavation support system designs unless requested in writing.

B. Submit, in accordance with Section 01300, an excavation work plan that includes the proposed methods of construction, including earthwork operations, excavation limits, slopes, ramp access, fill material moisture conditioning and handling, compaction equipment, sinking caisson method and procedure, and material sources for the various portions of the work.

C. Coordinate this submittal with the requirements of dewatering and support of excavation submittals.

1.05 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)
   1. ASTM D698 – Test Method for Laboratory Compaction Characteristics of Soils Using Standard Efforts.
   2. ASTM D1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu ft (2,700kN-m/cu m)).
   3. ASTM D 2487 – Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

B. Where reference is made to one of the above standards, the revision in effect at the time of providing the GMP shall apply.

1.06 QUALITY CONTROL

A. At all structures, prior to the placement of bedding material, concrete work mats, structural fill or structural concrete, coordinate with the soils testing laboratory to verify the suitability of the existing subgrade soil and to perform in-place soil density tests as required to verify that the compaction of the subgrade is sufficient.

B. Prior to and during the placement of backfill and fill, coordinate with the soils testing laboratory to perform in-place soil density tests to verify that the backfill/fill material has been compacted in accordance with the compaction requirements specified elsewhere. The ENGINEER may designate areas to be tested.

C. Payment for testing will be made by the CONTRACTOR and reimbursed through an allowance. If test results are unsatisfactory, all costs involved in correcting deficiencies in compacted materials to the satisfaction of the OWNER (including re-tests), will be borne by the CONTRACTOR.

1.07 DEFINITIONS

A. Where the phrase "in-the-dry" is used in this Section, it shall be defined to mean a soil condition such that the in-place moisture content of the soil at that time is no more than two percentage points above the optimum moisture content of that soil as

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determined by the laboratory test of the moisture-density relation appropriate to the specified level of compaction.

B. Where used in this Section "structures" refers to all buildings, wet wells, manholes and below grade vaults. Stormwater structures and duct banks are not considered structures in this context.

1.08 JOB CONDITIONS

A. The CONTRACTOR shall examine the site taking into consideration all conditions that may affect his work. The OWNER will not assume responsibility for variations of subsoil quality or conditions.

B. Existing Utilities: Locate existing underground utilities in the areas of work. If utilities are to remain in place, provide adequate means of protection during earthwork operations.
   1. Should unidentified, or incorrectly identified, piping or other utilities be encountered during excavation, consult the ENGINEER and the OWNER of such piping or utility immediately for directions.
   2. Cooperate with OWNER and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility OWNER.
   3. Demolish and completely remove from site existing underground utilities indicated to be removed.

C. Protection of Persons and Property:
   1. Barricade open excavations occurring as part of this work and post with warning lights. Operate warning lights as recommended by authorities having jurisdiction.
   2. Protect structures, utilities, sidewalks, pavements, and other facilities from possible damage which may result from settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

PART 2- GENERAL

1.01 SOIL MATERIALS

A. General:
   1. Backfill and Fill Materials: Satisfactory soil materials for this project are defined as a non-plastic, inorganic, granular soil having less than 10 percent material passing the No. 200 mesh sieve and containing less than 4 percent organic material. Materials for use as structural fill, common fill, and backfill shall be as described herein and shall be suitable for the intended application.
      a. Satisfactory soil materials shall be those complying with the American Association of State Highway and Transportation Officials (AASHTO) M 145 soil classification Groups A-1, A-2, and A-3.
      b. Unsatisfactory soil materials shall be those classified as AASHTO M 145 Groups A-4, A-5, A-6, and A-7, including peat and other highly organic soils.

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B. Structural Fill:
   1. Structural fill material shall consist of satisfactory soil material that is non-plastic, inorganic, granular, and free of organic, deleterious, or compressible material. Structural fill shall contain less than 10 percent material passing the No. 200 mesh sieve and less than 4 percent organic material. Rock, stones, or cobbles exceeding 2-1/2 inches in diameter shall not be permitted. Structural fill shall not contain hardpan, broken concrete, masonry, rubble, or other similar materials.

C. Common Fill:
   1. Common fill material shall be satisfactory soil material containing no more than 20 percent by weight finer than No. 200 mesh sieve. It shall be free from organic matter, muck, marl, and rock exceeding 2-1/2 inches in diameter. Common fill shall not contain broken concrete, masonry, rubble or other similar materials.
   2. 2. Material falling within the above specification, encountered during the excavation, may be stored in segregated stockpiles for reuse. All material which, in the opinion of the ENGINEER, is not suitable for reuse shall be spoiled as specified herein for disposal of unsuitable materials.

PART 3- EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which excavating, filling, and grading are to be performed. Notify the ENGINEER of any unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected.

B. Examine and accept existing grade of all structures prior to commencement of work and report to ENGINEER if elevations of existing subgrade varies from elevations shown on Drawings.

3.02 EXCAVATION

A. Excavation consists of the removal and disposal of material encountered when establishing required grade elevations.

B. Excavation Classifications: The following classifications of excavation will be made when unanticipated rock excavation or unclassified excavation is encountered in the work. Do not perform such work until material to be excavated has been cross-sectioned and classified by ENGINEER or specialized geotechnical consultant.
   1. Authorized earth excavation includes removal and disposal of pavements and other obstructions visible on ground surface, underground structures and utilities indicated to be demolished and removed, material of any classification indicated in soil boring data on subsurface conditions, and other materials encountered that are not classified as rock excavation or unauthorized excavation.
   2. Unauthorized excavation consists of removal of material beyond the limits needed to establish required grade and subgrade elevations without specific direction of ENGINEER. Unauthorized excavation, as well as remedial work

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directed by the ENGINEER shall be at the CONTRACTOR'S expense.

a. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending the indicated bottom elevation of the footing or base to the excavation bottom, without altering required top elevation. Lean (unreinforced) concrete fill may be used to bring bottom elevations to proper position, when acceptable to ENGINEER.
b. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by ENGINEER.

C. Additional Excavation: When excavation has reached required subgrade elevations, notify the ENGINEER who will inspect conditions.
1. If unsuitable bearing materials are encountered at the required subgrade elevations, carry excavations deeper and replace the excavated material as directed by the ENGINEER.
2. Removal of unsuitable material and its replacement as directed beyond the authorized limits will be paid based on contract conditions relative to changes in work. No work of this nature shall commence until approved in writing by the ENGINEER after approval by the OWNER.

D. Stability of Excavations: Slope sides of excavations to comply with local codes and ordinances having jurisdiction or as shown on the Drawings. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.
1. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

E. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers and cross braces, in good serviceable condition.
1. Establish requirements for trench shoring and bracing to comply with local codes and authorities having jurisdiction. Provide design drawings of all shoring and bracing signed and sealed by a Registered Professional ENGINEER in the state of Florida.
2. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.

F. Dewatering: The CONTRACTOR is solely responsible for all dewatering methods and providing proper equipment to perform such actions. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.
1. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations. Maintain groundwater table level a minimum of two foot below excavation level.
2. Convey water removed from excavations and rain water to collecting or run-off areas. Establish and maintain temporary drainage ditches and other diversions outside excavation limits for each structure. Do not use trench

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excavations as temporary drainage ditches.

3. While dewatering for new construction near existing structures, depletion of the groundwater level underneath these existing structures may cause settlement. To avoid this settlement, the groundwater level under these structures shall be maintained by appropriate methods of construction as approved by the ENGINEER.

G. Material Storage: Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage.
   1. Locate and retain soil materials away from edge of excavations.
   2. Dispose of excess soil material and waste materials as herein specified.
   3. All stockpiled materials shall be properly segregated based on usage and tested prior to use by the testing firm onsite.

H. Excavation for Structures: Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 feet and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection, or as shown on the Drawings.
   1. In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive concrete.

I. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.

3.03 COMPACTION

A. Unless otherwise specified in the geotechnical report, the prepared subgrade must meet the following minimum compaction requirements. In the event a discrepancy exists between this paragraph and Section 4 and 5 of the geotechnical report, the recommendations of the geotechnical report shall govern if more strict.
   1. Shallow building foundations and 5 feet around the perimeter of buildings: Compact top 12-inches of subgrade and each layer of backfill or fill material at 95% of the modified Proctor maximum dry density (ASTM D1557).
   2. Building Slabs: Compact top 12-inches of subgrade and each layer of backfill or fill material at 95% of the modified Proctor maximum dry density (ASTM D1557).
   3. Mat Foundation Structures: Mat foundation bearing soils should be compacted to at least 95 percent of the soils modified Proctor maximum density, to a depth of at least 12 feet below the foundation bearing level.
   4. Lawn or Unpaved Areas: Compact top 6 inches subgrade and each layer of backfill or fill using hand compaction and 8 inches using roller operated compaction equipment in static head mode.
   5. Walkways: Compact top 12inches of subgrade 95% maximum dry density.
   6. Pavements and Steps: Compact top 12inches of subgrade at 98% maximum dry density.

3.04 STRUCTURAL BACKFILL AND FILL SOILS

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A. General: Place material in layers to required subgrade elevations, for each area classification listed below.
   1. In excavations, use satisfactory excavated material or borrow material.
   2. Under grassed areas, use satisfactory excavated material or borrow material.
   3. Under walks and pavements, use subbase material.

B. Backfill excavations as promptly as work permits, but not until completion of the following:
   1. Acceptance by ENGINEER of construction below finish grade including, where applicable, damp proofing, waterproofing, and perimeter insulation.
   2. Inspection, testing, approval, and recording locations of underground utilities.
   3. Removal of concrete formwork.
   4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials.
   5. Removal of trash and debris.
   6. Permanent or temporary horizontal bracing is in place on horizontally supported walls. Layout and location of bracing shall consider loads of the structure as well as the effects of the soil and groundwater.

C. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow strip, or break-up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.
   1. When existing ground surface has a density less than that specified under "Compaction" for the particular area classification, break up the ground surface, pulverize, moisture condition to the optimum moisture content, and compact to required depth and percentage of maximum density.

D. Placement and Compaction: Place structural backfill and fill materials in layers not more than 12 inches loose depth for material compacted by vibratory drum roller equipment as specified in the geotechnical report, and not more than 8 inches loose depth for material compacted if the roller is operated in the static mode. If hand-held compaction equipment is used, the lift thickness should be reduced further to 6inches.
   1. Before compaction, moisten or aerate each layer as necessary to provide the optimum moisture content. Compact each layer to required percentage of the modified Proctor maximum dry density specified. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
   2. Place backfill and fill materials evenly adjacent to structures, to required elevations. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around structure to approximately same elevation in each lift.
   3. Large compaction equipment shall not be used within 5 feet of walls.

3.05 GRADING

A. General: Uniformly grade areas within limits of grading under this Section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.

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B. Grading Outside Building Lines: Grade areas adjacent to building lines, as shown on the Drawings, to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes, and as follows:
   1. Lawn or Unpaved Areas: Finish areas to within not more than 0.10 feet above or below the required elevation.
   2. Walks: Shape surface of areas under walks to line, grade and cross-section, with finish surface not more than 0.10 feet above or below the required subgrade.

C. Grading Surface of Fill Under Building Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/2 inch when tested with a 10-foot straightedge.

D. Compaction:
   1. After grading, compact subgrade surfaces to the depth and percentage of modified Proctor maximum dry density and/or the standard maximum dry density specified.

E. All unacceptable or unsuitable material encountered within the limits of excavation or grading shall be removed and disposed of by the CONTRACTOR as directed by the ENGINEER.

F. During excavation and grading operations, the CONTRACTOR shall maintain the work area in a well-drained condition at all times. Temporary drains and drainage ditches shall be installed as necessary to intercept or divert surface water that may affect the work.

G. Do not over-excavate and backfill to achieve final grades. Excavation shall be performed to the required lines and grades.

H. When excavated material cannot be immediately placed in its final location, it shall be stockpiled in approved areas for later use. No additional compensation will be provided for stockpiling, rehandling, or double handling of excavated material.

I. No grading or excavation shall be performed in areas containing existing pipelines or utilities that may be uncovered or damaged until such utilities are relocated, protected, or properly abandoned in accordance with the Drawings and as directed by the ENGINEER.

3.06 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction: Allow testing service to inspect and approve subgrades and fill layers before further construction work is performed.

B. The CONTRACTOR shall provide additional compaction and testing based on testing service reports and inspection for subgrade or fills which have been placed that are below specified density.

3.07 MAINTENANCE

A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
   1. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

B. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.

3.08 DISPOSAL OF SURPLUS AND WASTE MATERIAL

A. All surplus and/or unsuitable excavated material shall be disposed of in one of the following ways as directed by the OWNER.
   1. Transport to soil storage area on OWNER's property and stockpile or spread as directed by the OWNER.
   2. Transport from OWNER's property and legally dispose of at an approved disposal facility. Any permit required for the hauling and disposing of this material beyond OWNER's property shall be obtained prior to commencing hauling operations.
   3. Suitable excavated material may be used for fill if it meets the specifications for common fill and is approved by the ENGINEER. Excavated material so approved may be neatly stockpiled at the site where designated by the ENGINEER provided there is an area available where it will not interfere with the operation of the facility nor inconvenience traffic or adjoining property OWNERs.

END OF SECTION 02220

SECTION 02282

TERMITE CONTROL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including SJCUD general conditions and Division 01 Specification Sections, apply to this Section.

B. Termite control shall be provided on at the following buildings:
   1. Electrical building

1.02 SUMMARY

A. This Section includes soil and foundation treatment for subterranean and Formosan termite control.

1.03 SUBMITTALS

A. Product data and application instructions in accordance with Section 01300.

B. Certification that products used comply with U.S. Environmental Protection Agency (EPA) regulations for termiticides.

1.04 QUALITY ASSURANCE

A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for preparing substrate and application.

B. Engage a professional pest control operator who is licensed per regulations of governing authorities to apply soil treatment solution.

C. Use only termiticides that bear a federal registration number of the EPA and are approved by local authorities having jurisdiction.

1.05 JOB CONDITIONS

A. Restrictions: Do not apply soil treatment solution until excavating, filling, and grading operations are completed, except as otherwise required in construction operations.

B. To ensure penetration, do not apply soil treatment to frozen or excessively wet soils or during inclement weather. Comply with handling and application instructions of the soil toxicant manufacturer.

1.06 WARRANTY

A. Furnish written warranty, executed by the applicator and CONTRACTOR, certifying that applied soil termiticide treatment will prevent infestation of subterranean and Formosan termites. If termite activity is discovered during warranty period, CONTRACTOR will retreat and repair or replace damage caused by termite infestation.

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B. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 SOIL TREATMENT SOLUTION

A. General: Use an emulsible, concentrated termiticide that dilutes with water, specially formulated to prevent termite infestation. Fuel oil will not be permitted as a diluent. Provide a solution consisting of approved chemical elements, with successful testing and proven effectiveness against termites.

B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
   1. PREMISE PRE-CONSTRUCTION INSECTICIDE:
      a. Bayer Environmental Science.
   2. TALSTAR TERMITICIDE/INSECTICIDE:
      a. FMC CORPORATION
   3. TERMIDOR 80 WG TERMITICIDE/INSECTICIDE:
      a. BASF CORPORATION

   Dilute with water to concentration level recommended by manufacturer. Other solutions may be used as recommended by applicator if approved for intended application by local authorities having jurisdiction. Use soil treatment solutions that are not harmful to plants.

PART 3 - EXECUTION

3.01 APPLICATION

A. Surface Preparation: Remove foreign matter that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and foundations. Toxicants may be applied before placing compacted fill under slabs if recommended by toxicant manufacturer.

B. Apply soil treatment solution as follows:
   1. Under new slab-on-grade structures, treat soil before concrete slabs or integral slab/footings are placed, using approved application rates and volumes as recommended by the manufacturer.

C. At existing slab-on-grade structures, treat soil by rodding at close intervals at slab perimeter, at joint between slab/foundation edge and adjacent soils or existing paving. Drill small holes in existing asphalts or materials as required for pump application of liquid chemical treatment below surface. Spray or pump treatments into all cracks and crevices in slabs, at expansion joints, and into slab penetrations at plumbing or conduit openings, etc. until saturated.

D. At slab areas where existing concrete is cut for new plumbing or utility installations, mix chemical solution with soil or backfill material as it is being replaced in the excavation, or otherwise treat disturbed open area before slab patching.

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E. Post signs in areas of application to warn workers that soil termiticide treatment has been applied. Remove signs after areas are covered by other construction.

F. Reapply soil treatment solution to areas disturbed by subsequent excavation, landscape grading, or other construction activities following application.

G. Applying Borate Treatment (where applicable):
   1. Application: Mix wood treatment borate solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of borate, per manufacturer's EPA-Registered Label, so that wood framing and/or wood sheathings and structural members subject to infestation receive treatment.
   2. Framing and Sheathing: Apply borate solution by spray to bare wood for complete coverage.

END OF SECTION 02282

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SECTION 02366

STEEL SHEET PILING

PART 1 - GENERAL

1.01 SUMMARY OF WORK

A. This Section specifies requirements for the temporary steel sheet pile wall that may be required for construction at the Water Treatment Plant:
   1. The temporary wall system shall be a cantilever wall system capable of resisting water, soil, and construction loads to the existing top of grade.

B. CONTRACTOR shall complete the following Work:
   1. The work covered herein includes the design (signed and sealed by a Florida Registered Professional ENGINEER), materials, labor and equipment necessary for installation of the temporary steel sheet pile wall as shown on the Plans and specified herein. Because the wall is temporary, the CONTRACTOR is not required to provide new material but shall be required to provide material fit for purpose.
   2. In particular, the following work is included herein:
      a. Final sheet pile wall design and Drawings signed and sealed by a registered Florida ENGINEER.
      b. Supply and installation of a steel sheet pile wall including mobilization and demobilization.
      c. Removal of steel sheet pile wall inclusive of mobilization and demobilization as required.
      d. Furnishing of all submittals required by this Section of the Specifications.

C. All costs for performing the Work under this section shall be included in the lump-sum bid.

1.02 QUALITY ASSURANCE

A. Company performing the Work of this Section shall have at least five years minimum experience performing this type of Work. CONTRACTOR shall identify and furnish references for a minimum of five (5) similar projects involving installation of steel sheet pile via the methods proposed by the CONTRACTOR for the Work of this Section.

B. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.03 EXISTING INFORMATION

A. A geotechnical report produced by Meskel & Associates Engineering dated June 1, 2017 including boring logs and locations are provided for information as well as soil characteristics for use in designing the cantilever retaining walls.

CONTRACTOR is responsible for any conclusions he/she may draw from this information, including the character of the materials that may be encountered and the degree of difficulty to be expected in the performance of the Work. OWNER does not guarantee that materials other than those disclosed by the borings will not be encountered, or that proportions and character of the various materials will not vary from those indicated in the boring logs.

1.04 REFERENCES

B. The latest edition and addenda of the following publications in effect on the date of Contract Award are part of this Specification and, where referred to by title or basic designation only, are applicable to the extent indicated by the specific reference:

1. American Society for Testing and Materials (ASTM):
   a. A572/A572M – Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
2. American Welding Society (AWS):
   a. D1.1/D1.1M.1 Structural Welding Code – Steel
3. Code of Federal Regulations (CFR)
   a. 1910 –Occupational Safety and Health Standards (OSHA)
   b. 1926 – Safety and Health Regulations for Construction

C. The CONTRACTOR shall conform to the requirements of the above standards and all other Sections of these Specifications, unless otherwise specified herein. In the event of a conflict between these specifications and the referenced standards, the more stringent requirement shall control.

1.05 SUBMITTALS

A. Comply with pertinent provisions of Section 01300.

B. Equipment: CONTRACTOR shall submit complete descriptions of the equipment for the Work, including caps, leads, and guides where required. The description of the hammer proposed for driving piles shall include make and model number, weight, and driving parameters.

C. Drawings: Design drawing(s) showing the location and layout of the sheet pile wall, prepared by an ENGINEER licensed in the State of Florida (signed and sealed).

D. Catalog data on the sheet piles being proposed; they shall be hot-rolled as cold form sheets will not be allowed.

E. Complete set of design calculations signed and sealed by a Florida registered ENGINEER.

F. Method Statement

1. The CONTRACTOR shall submit to the OWNER for approval, a minimum of 30 days prior to beginning installation, a method statement and a schedule of the procedures and sequence of operations he intends to use. The schedule shall show in detail, the proposed method, sequence, and timing of all steel sheet pile driving and other operations, catalogue data, and manufacturer's specifications for all cranes, hammers, cap blocks, cushions, and accessories to be used on site, as well as methods of lifting and handling, methods of alignment and positioning of steel sheet piles within the required tolerances, and methods of driving, re-driving, and cutting of steel sheet piles.
   a. Following is the main list of information and data that the CONTRACTOR shall submit in his method statement:
      1) A complete list of all the equipment he intends to use, and the quantity of each, including the spare equipment. This shall include manufacturer information describing the hammers proposed for use, including cap block arrangement and properties, weight and length of stroke of hammer's striking parts, number of operating blows per minute at piston area, and effective piston pressure to be maintained. The equipment list shall show that the CONTRACTOR has suitable and sufficient equipment to perform the work according to the timetable, and to finish it according to the milestone dates.
      2) Clear and documented information about intended sheet pile transportation, storage, or installation, including information about the manner in which the CONTRACTOR will accommodate OWNER site operations.
      3) Clear and documented information about the cranes he intends to use on land and/or on barge, including information regarding the cranes' outreach with different hammers and sheet pile element lifting weights. It is the intent that the wall be installed utilizing land-based equipment unless otherwise approved during the submittal process.
      4) Clear descriptions and drawings showing how the CONTRACTOR intends to drive the wall.
      5) Drawings clearly showing the driving phases in coordination with other Work.
2. The CONTRACTOR is solely responsible for the working procedure, thus, procedure approval and/or disapproval by the OWNER shall not provide the CONTRACTOR with any waiver of his total responsibility, and shall not change any price and/or time of execution according to the schedule.
3. The submittal of CONTRACTOR's details and other information to the OWNER shall not relieve the CONTRACTOR of any part of his responsibility, under the Contract, for the true and timely construction of the works.

G. Certificate

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1. Submit certificate stating that all materials and procedures meet or exceed the specified requirements of this Section.
2. A certification by pile hammer manufacturer of the energy, condition, and operational characteristics of each pile hammer.

1.06 PRODUCT HANDLING

A. Comply with pertinent provisions of Division 1 of these Specifications.

B. Avoid damage to piles during handling and transportation.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Steel Sheet Piling
1. All sheet piling shall be hot-rolled steel sections in accordance to the section and Engineering properties set forth in the signed and sealed drawings by the Florida professional ENGINEER.

B. Coating
1. Coating not required due to temporary nature of this Work.

2.02 DRIVING EQUIPMENT

A. Pile Hammers
1. All pile hammers shall be new or re-conditioned, and calibrated for energy per the manufacturer's catalog. They shall be of a size and type capable of consistently delivering an effective dynamic energy, suitable for driving/vibrating the steel sheet piles into the soils at the various locations across the site, with proper driving helmets suited for the steel sheet piles. The CONTRACTOR must provide information to show that the hammer(s) proposed have been used for driving similar steel sheet pile sections, of similar length and weight, to similar depths, in similar geotechnical conditions. The OWNER reserves the right to require the CONTRACTOR to perform a wave equation analysis using the WEAP program, to verify that the proposed hammer(s) is suitable. Such analysis, if required by the OWNER, shall be performed at no additional cost.
2. Vibratory hammers shall be hydraulically operated and impact hammers shall be of the air or hydraulic powered type, and the selected ones shall be approved by the OWNER.
3. The CONTRACTOR is solely responsible for the selection and supply of hammers capable of driving the sheet piles to the required depth.
4. The CONTRACTOR shall provide, in advance, appropriate extractors to extract driven sheet piles which have been rejected by the ENGINEER.

5. The CONTRACTOR shall also test all hammers and supply official test certificates to confirm that the hammers consistently provide their full rated energy.
6. No steel sheet piles shall be driven prior to hammer approval.

B. Leads
1. Sheet pile driver leads shall be constructed in a manner which afford the hammer freedom of movement, and shall be held in position by guides or stiff braces to ensure firm support of the steel sheet piles during driving.

C. Templates
1. All steel sheet piles shall be driven with templates as necessary to ensure proper location and plumbness of the steel sheet piles. They shall be suitable, heavy, adequately rigid, and straight, and adapted to the length and the weight of the steel sheet piles to be driven.
2. Templates and driving details, including fabrication drawings, shall be submitted to the ENGINEER for informational purposes, prior to fabrication. The CONTRACTOR shall be responsible for the accurate location and securing of the templates in their correct positions before driving steel sheet piles.

PART 3 - EXECUTION

3.01 CONTRACTOR’S RESPONSIBILITY

A. The CONTRACTOR's sequence of execution must take into account the properties of the steel sheet pile elements, geotechnical conditions, site construction, and weather conditions. The sequence of execution shall be submitted to the ENGINEER for approval prior to implementation and at any time a change is proposed.

B. The CONTRACTOR is solely and completely responsible for the design, installation and driving of the steel sheet piles to the required depth. He shall make his own independent evaluation of the sub-soil conditions, taking into consideration all available data. He shall also take into consideration weather and site conditions, driving locations of all the sheet pile walls, seasons, progress of other work, construction sequencing/phasing requirements, and as specified on the Drawings, in establishing the steel sheet pile driving procedure and method, as well as equipment requirements, to satisfactorily drive the sheet piles and overcome any and all difficulties and/or contingencies.

C. If the CONTRACTOR intends to use unconventional equipment, he shall prove its soundness and suitability by calculations.

D. No claims for extras in connection with the satisfactory sheet pile installation, performance and removal, and no extension of time for completion of the work, will be considered due to sheet pile installation difficulties.

E. The CONTRACTOR is solely responsible for insuring that the final sheet pile installation satisfies the objectives specified herein.

3.02 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct all conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.03 DRIVING

A. Alignment and Tolerances
   1. The following tolerances are acceptable for the driven steel sheet pile walls:
      a. Deviation from verticality perpendicular to the plane of the wall: 1:100.
      b. Horizontal deviation of final top of cantilever steel sheet pile wall element from the front face theoretical line: ±1 inch. after installation.
      c. Center-to-center deviation of main steel sheet pile spacing: as specified in manufacturer's catalog.
      d. Vertical deviation of final penetration levels: ±1 inch.

3.04 PREPARATION

A. Steel Sheet Pile Coating
   1. Sheet pile coating is not required as this wall is temporary and will be removed. The proposed sheet piles shall however be clean and free of any environmentally harmful surface coatings and suitable for use as the reclaimed water pond will remain in use.

3.05 INSTALLATION

A. General
   1. All steel sheet piles shall be accurately positioned at their location, and according to the alignment and spacing shown on the Drawings and approved submittals. Installation of all piles shall be performed in the presence of the ENGINEER. The ENGINEER shall be given a minimum of 5 days advance notice in advance of any steel sheet pile installation, in order to arrange attendance.

B. Preparation for Driving
   1. All steel sheet piles shall be marked with their numbers, as indicated on the Shop Drawings, at clearly visible locations.
   2. Before driving, the piles shall be suitably painted with transverse lines, at intervals of 4 inch., on the portion of the pile exposed after placement

before driving, with figures indicating pile length, measured from zero at the pile toe, at intervals of 5 ft.

C. Driving Procedure

1. The CONTRACTOR shall propose the driving procedure, in compliance with the site conditions. This procedure shall be part of the method statement.
2. The CONTRACTOR shall consider the construction sequence/phasing limitations noted on the approved Drawings.
3. The CONTRACTOR shall drive the sheet piles according to the approved Drawings, vertically and to the depth shown on the approved Drawing.
4. Templates shall be secured in final position and approved by the OWNER, before driving the steel sheet piles.
5. The CONTRACTOR shall install the steel sheet piles by vibration and/or driving only. Other methods, if necessary to attain the required penetration, will only be permitted subject to approval by the OWNER.
6. Each steel sheet pile shall be driven or vibrated continuously and without interruption, until the required penetration has been obtained. Deviation from this procedure will be permitted only if driving is stopped by causes that could not reasonably have been anticipated. If a pile cannot be driven to the required tip elevation due to hard driving conditions, the CONTRACTOR shall either use a larger hammer, as approved by the OWNER, or take whatever other measures are necessary to break up the subsurface material. A steel sheet pile that cannot be driven to the required depth because of an underground obstruction, other than the normal soil conditions, shall be pulled, and the obstruction removed or penetrated as approved, or, if not approved, as instructed by the OWNER.
7. Should the CONTRACTOR select a vibratory hammer and should the vibratory hammer not be capable of driving all or some of the sheet piles to the required tip elevation, the CONTRACTOR shall use an impact hammer to continue driving the sheet piles to the required tip elevation, at no additional cost, regardless of whether the vibratory hammer may have been approved by the OWNER. The impact hammer shall be approved by the OWNER prior to its use.

D. Corrections and Deficiencies

1. The CONTRACTOR shall notify the ENGINEER immediately, in writing, of the failure of any sheet pile to meet any requirement of this Section. Such written notification shall include all information required for the evaluation of remedial measures.

END OF SECTION 02366

SECTION 02400

GRADED AGGREGATE BASE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of contract, including SJCUD general conditions and other Specification Sections, apply to the work of this section.

1.02 DESCRIPTION OF WORK

A. This item shall consist of a base course of graded aggregate for all asphaltic roadways and concrete constructed on a subgrade prepared in accordance with the specifications and in conformity with the line, grades, and typical cross-section as shown on the Drawings.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Use graded aggregate material which yields a satisfactory mixture meeting all the requirements of these Specifications after it has been crushed and processed as a part of the mining operations.

B. The CONTRACTOR may furnish the material in two sizes of such gradation that, when combined in a central mix plant pugmill, the resultant mixture meets the required specifications.

C. Use graded aggregate base material of uniform quality throughout, substantially free from organic matter, shale, lumps and clay balls, and having a limerock bearing ratio (LBR) value of not less than 100. Use material retained on the No. 10 sieve composed of aggregate meeting the following requirements:

Soundness Loss, Sodium, Sulfate: AASHTO T104
15 Percent Wear: AASHTO T 96 (Grading A)
Group 1 Aggregates..... 45 Percent
Group 2 Aggregates..... 65 Percent
Group 1: This group of aggregates is composed of limestone, marble, or dolomite.
Group 2: This group of aggregates is composed of granite, gneiss, or quartzite.
Use graded aggregate base material meeting the following gradation:

Sieve Size	Percent by Weight Passing
2 inch	100
1 1/2 inch	95 to 100
3/4 inch	65 to 90
3/8 inch	45 to 75
No. 4	35 to 60
No. 10	25 to 45
No. 50	5 to 25
No. 200	0 to 10

1. For Group 1 aggregates, ensure that the fraction passing the No. 40 sieve has a Plasticity Index (AASHTO T90) of not more than 4.0 and a Liquid Limit (AASHTO T89) of not more than 25, and contains not more than 67 percent of the weight passing the No. 200 sieve.
2. For Group 2 aggregates, ensure that the material passing the No. 10 sieve has a sand equivalent (AASHTO T 176) value of not less than 28.
3. The CONTRACTOR may use graded aggregate of either Group 1 or Group 2, but only use one group on this project. (Graded aggregate may be referred to hereinafter as "aggregate".)

2.02 EQUIPMENT

A. The aggregate shall be spread by mechanical rock spreaders, equipped with a device which strikes off the aggregate uniformly to laying thickness, and capable of producing an even distribution of the aggregate. For crossovers, intersections and ramp areas; for roadway widths of 20 feet or less; for the main roadway area when forms are used and for any other areas where the use of a mechanical spreader is not practicable; spreading may be done by bulldozers or blade graders. All equipment for proper construction of this project shall be in first- class working condition.

PART 3 - EXECUTION

3.01 TRANSPORTING GRADED AGGREGATE

A. The graded aggregate shall be transported to the point where it is to be used, over aggregate previously placed if practical, and dumped on the end of the preceding spread.

3.02 SPREADING GRADED AGGREGATE

A. Method of Spreading: The graded aggregate shall be spread uniformly. All segregated areas of fine or coarse aggregate shall be removed and replaced with properly graded aggregate.

B. Number of Courses: When the specified compacted thickness of the base is greater than six inches, the base shall be constructed in two courses. The thickness of the first course shall be approximately one-half the total thickness of the finished base, or enough additional material added to bear the weight of the construction equipment without disturbing the Subgrade. When compacted thickness is six inches or less, graded aggregate shall be placed in one lift.

3.03 COMPACTING AND FINISHING BASE

A. Single-Course Base: For single-course base, after the spreading is completed, the entire surface shall be scarified and then shaped so as to produce the required grade and cross-section, free of scabs and laminations, after compaction.

B. Multiple-Course Base: For multiple-course base, the first course shall be cleaned of foreign material and bladed and brought to a surface cross- section approximately parallel to that of the finished base. Prior to the spreading of any material for the upper course, the density tests for the lower course shall be made, and the ENGINEER shall have proof that the required compaction has been obtained. After the spreading of the material for the second course is completed, its surface shall be finished and shaped so as to produce the required grade and cross-section after compaction, and free of scabs and laminations.

C. Moisture Content: When the material does not have the proper moisture content to ensure the required density, wetting or drying will be required. When water is added, it shall be uniformly mixed-in by disking to the full depth of the course which is being compacted. Water shall be added before beginning compaction operations. Wetting or drying operations shall involve manipulation, as a unit, of the entire width and depth of the course which is being compacted. This shall be performed utilizing the speedy moisture meter.

3.04 DENSITY REQUIREMENTS

A. As soon as proper conditions of moisture are attained, the material shall be compacted to a density of not less than 98 percent of the modified proctor maximum density as determined by AASHTO T-180 (Modified Proctor).

3.05 TESTING SURFACE, PROTECTION, AND MAINTENANCE

A. Density Tests: A minimum of at least one field density test on each course of compacted base shall be performed for every 500 square yards, or every 300 linear feet of road pavement, or as directed by the ENGINEER. Additional tests may be made if deemed necessary by the ENGINEER and/or OWNER.

B. During final compacting operations, if blading of any areas is necessary to obtain the true grade and cross-section, the compacting operations for such areas shall be completed prior to making the density tests on the finished base.

C. Correction of Defects: Contamination of Base Material: If, at any time, the subgrade material should become mixed with the base course materials, the CONTRACTOR shall, without additional compensation, dig out and remove the mixture, reshape, and compact the subgrade and replace the materials removed with clean base material, which shall be shaped and compacted as specified above.

D. Cracks and Checks: If cracks or checks appear in the base, either before or after priming, which in the opinion of the ENGINEER, would impair the structural efficiency of the base, the CONTRACTOR shall remove the cracks or checks by re-scarifying, reshaping, adding base material where necessary, and re-compacting, without additional compensation.

E. Compaction of Widening Strips: Where base construction consists of widening strips and the trench width is not sufficient to permit use of standard base compaction equipment, compactors, trench rollers, mechanical plate tampers, or other special equipment which will achieve the density requirements specified herein. When multiple-course base construction is required by the plans or specifications, the required compaction shall be achieved in each course prior to spreading material for the overlaying course.

F. Testing Surface: The finished surface of the base course shall be checked from the required crown and ensure longitudinally a smooth, consistent surface for the placement of the asphalt course(s). All irregularities, greater than 1/4 inch per 15-foot straight edge test, shall be corrected, after which the entire area shall be re-compacted and tested as specified herein before. In the testing of the surface, the measurements will not be taken in small holes caused by individual pieces of rock having been pulled out by the grader.

G. Priming and Maintaining:
   1. Priming: The prime coat shall be applied only when the base meets the specified density requirements and the moisture content in the top half of the base does not exceed 90 percent of the optimum moisture of the base material. At the time of priming, the base shall be firm, unyielding and in such condition that no undue distortion will occur.
   2. Maintaining: The CONTRACTOR will be responsible for assuring that the true crown and template are maintained, with no rutting or other distortions, and that the base meets all the requirements, at the time the surface course is applied.

H. Thickness Requirements:
   1. Measurements: Thickness of the base shall be measured at intervals in such a manner that each test represents 500 square yards, or every 300 linear feet of road pavement, or as otherwise directed by the ENGINEER. Measurements shall be taken at various points on the cross-section, through holes not less than three inches in diameter.
   2. Areas Requiring Correction: Where the compacted base is deficient by more than ½ inch from the thickness called for in the plans, the CONTRACTOR shall correct such areas. The affected areas shall then be brought to the required state of compaction and to the required thickness and cross- section.

END OF SECTION 02400

SECTION 02605

PRECAST CONCRETE STRUCTURES

PART 1 – GENERAL

1.01 DESCRIPTION

A. CONTRACTOR shall provide all professional services, labor, materials, equipment and incidentals as shown, specified and required to design, furnish, and install all precast concrete structures.

B. Structures shall conform in shape, size, dimensions, material, and other respects to the details shown or as ordered by ENGINEER. Minimum thickness sizes for slabs and walls are provided on the Drawings.

C. All sanitary sewer and wet well structures shall be governed by this specification. All stormwater inlet structures shall be governed by Section 02610 – Site Drainage.

1.02 RELATED SECTIONS

A. Section 02220 – Trenching, Bedding, and Backfill for Structures

1.03 QUALITY ASSURANCE

A. Standards referenced in this Section are:
   1. American Association of State Highway and Transportation Officials (AASHTO).
   2. ASTM C 478, Standard Specification for Circular Precast Reinforced Concrete Manhole Sections.
   3. AWWA C 302, Reinforced Concrete Pressure Pipe, Non-Cylinder Type for Water and Other Liquids.
   4. Precast/Prestressed Concrete Institute (PCI) MNL-116, Manual for Quality Control for Plants and Production of Structural Precast Concrete Products.

B. Fabrication Tolerances:
   1. General: Fabricate precast concrete units complying with manufacturing and testing procedures, quality control recommendations, and dimensional tolerances of PCI MNL-116, unless otherwise indicated. Keep bar sizes small, even where this will reduce the spacing of the bars.
   2. Units shall be true to dimensions. Unit bow, as fabricated and installed, shall not exceed 1/8-inch per unit in the short dimension and 1/4 inch per unit in the long dimension. Step in alignment face and jog in alignment shall not exceed 1/4-inch. Provide a 3/4-inch chamfer or 1 x 2-inch radius on all exposed edges and corners.
   3. Imperfections such as air bubbles, ripples, joint lines, warpage, stains, projections, honeycombs, uneven matrix plate, and other defects will not be acceptable.

C. Qualifications and Responsibilities of CONTRACTOR's Design Professional:
   1. Professional Engineer
      a. Engage a registered professional engineer qualified to practice in the State of Florida and experienced in providing engineering services of the kind indicated.
      b. Responsibilities include but are not necessarily limited to:
         1) Carefully reviewing precast concrete structural performance and design criteria stated in the Contract Documents.
         2) Preparing written requests for clarifications or interpretations of performance or design criteria for submittal to ENGINEER by CONTRACTOR.
         3) Preparing or supervising the preparation of design calculations and related drawings, shop drawings, testing plan development, test result interpretation and a comprehensive engineering analysis verifying compliance of the precast concrete structure with the requirements of the Contract Documents.
         4) Signing and sealing all calculations and design drawings, and shop drawings.
         5) Certifying that:
            i. It has performed the design of the precast concrete structure in accordance with the performance and design criteria stated in the Contract Documents, and
            ii. The said design conforms to all applicable local, state and federal codes, rules and regulations, and to the prevailing standards of practice.

D. Qualifications of Fabricator: A firm that complies with the following requirements and is experienced in producing structural precast concrete units similar to those indicated for this Project and with a record of successful in-service performance.
   1. Participates in PCI's Plant Certification program at the time of bidding and is designated a PCI-certified plant for Group C, Category C1 – Precast Concrete Products (no pre-stressed reinforcement).
   2. Certification shall be maintained throughout the production of the precast concrete units. Production shall immediately stop if at any time the fabricator's certification is revoked, regardless of the status of completion of contracted work. Production will not be allowed to re-start until the necessary corrections are made and certification has been re-established. In the event certification(s) cannot be re-established in a timely manner, causing project delays, the fabricator, at no additional cost, will contract out the remainder of the units to be manufactured at a PCI certified plant.

1.04 SUBMITTALS

A. Submit for approval the following:
   1. Qualifications
      a. Submit qualifications data for the CONTRACTOR's Design Professional.
   2. Precast Structures
      a. Drawing showing design and construction of all precast concrete, as well as the location and details of all items that are to be embedded in the precast units.
      b. Provide manhole drawings showing the elevations and all piping to and from each structure.
      c. Design calculations and shop drawings, signed and stamped with a seal of a Registered Professional Engineer licensed to practice in the State of Florida and PE certification provided in Section 01300.
      d. Test result from concrete cylinder strength tests.

B. Shop Tests
   1. Submit description of proposed testing methods, procedures and apparatus. Prepare and submit report for each test.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials
   1. Deliver precast concrete units to project site in such quantities and at such times to assure continuity of installation.

B. Storage of Materials
   1. Store units at project site in a manner that will prevent cracking, distortion, warping, staining, or other physical damage and so that precast copings are without damage at time of installation.

C. Handling of Materials
   1. Lift and support units only at designated lifting or supporting points as shown on final Shop Drawings.

PART 2 – PRODUCTS

2.01 PRECAST CONCRETE STRUCTURES

A. Layout and details shall be as shown and specified. Design shall be adequate to withstand live loads, lateral earth pressure loading, and uplift case.
   1. Design Criteria
      a. Top slab live load: 300 psf.
      b. Maximum ground water table = assume at existing ground surface

c. Vertical surcharge on soil of 300 psf.
d. Safety factor for uplift normal ground water > 1.5.
e. Safety factor for uplift 100 year storm ground water > 1.1.

2. Design shall meet the requirements of ACI 350 and the current Florida Building Code.

B. Concrete Mix: Standard-weight concrete consisting of specified Portland cement, pigments, aggregates, admixtures, and water to produce the following properties:
1. Compressive Strength: 5,000 psi minimum at 28 days.
2. Total Air Content: not less than 4 percent nor more than 6 percent.

C. Where precast structures are made up of various precast components such as base sections, riser sections and top sections, the joint between sections shall be watertight and be the tongue and groove type complying with AWWA C302.

D. Walls shall be precast with wall pipes or with pipe sleeves with water stop suitable for application or as shown on Drawings.

E. Precast structure shall be designed and constructed to accept access hatches or castings as shown and specified.

F. Precast structures shall be designed to support the weight of equipment lifted from the station to the top slab as necessary.

G. Underground precast units shall have a shop-applied exterior coating. The units shall be given two coats of bitumastic coating with a total dry film thickness of 12 mils. Each coat shall be applied at a rate not to exceed one gallon per 100 square feet. Time shall be allowed between coats to permit sufficient drying. Field application of coating is unacceptable except for coating repairs.

H. The interior of any precast structures exposed to sewage and sewer gases (all manholes and in-plant drain pump station) shall be coated per Section 03446 – Specialty Coatings and Linings.

I. Lifting holes, if used, shall be tapered. Tapered, solid rubber plugs shall be furnished to seal the lifting holes. The lifting holes shall be made to be sealed by plugs driven from the outside face only.

J. Mark date of manufacture and name of trademark of manufacturer on inside of barrel.

2.02 ACCESS HATCHES AND CASTINGS

A. All necessary access hatches as shown and specified shall be cast into concrete as necessary, refer to the civil details for additional requirements.

B. Provide manhole covers as per SJCUD details as shown on the Drawings.

C. The CONTRACTOR shall provide built-up type brick risers to place castings at grade where shown on the Drawings.

2.03 SHOP TESTING

A. At a minimum, conduct the following shop test:
   1. Conduct concrete cylinder strength tests. Cylinders shall be cured in the same manner as the precast structures. Collect a minimum of 1 test cylinder from every 10 cubic yards of concrete poured.

PART 3 – EXECUTION

3.01 INSPECTION

A. CONTRACTOR and his installer shall examine the substrate and the conditions under which Work is to be performed and notify OWNER of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to OWNER.

3.02 INSTALLATION

A. Set units in true alignment. All joints shall be sealed with cement mortar inside and out and troweled smooth to the contour of the wall surface. Raised or rough joint finishes will not be accepted.

B. Precast structures shall be set on a crushed stone, crushed gravel, or concrete foundation as shown on drawings and in accordance with geotechnical recommendations. Precast units shall be set at the proper grade and carefully leveled and aligned.

C. Install units in accordance with manufacturer’s recommendations.

D. Replace precast concrete units damaged for any reason or which fail to perform as specified.

E. Each structure shall be watertightness tested and the ENGINEER shall observe each test.

1. Lower groundwater table below bottom of the manhole, wet well, or structure for the duration of the test. Plug all pipes and other openings into the structure and brace to prevent blow out. Fill structure with water to the top of the section. If the excavation has not been backfilled and no water is observed moving down the surface of the structure, the structure is satisfactorily watertight. If the test, as described above is unsatisfactory as determined by the ENGINEER, or if the structure excavation has been backfilled, continue the test. A period of time may be permitted to allow for absorption. Following this period, refill manhole to the top of the cone, if necessary and allow at least 8 hours to pass. The requirement shall be zero leakage over the time period. Uncover the rejected structure as necessary and to disassemble, reconstruct or replace it as directed by the ENGINEER. Retest the structure and, if satisfactory, fill and paint the interior joints.
2. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorptions, etc. It will be assumed that all loss of water during the test is a result of leaks through the joints or through the concrete.
3. Testing shall be completed prior to any interior coating being applied.

END OF SECTION 02605

SECTION 02910

SODDING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This Work consists of sodding areas cleared during construction and not paved, or as otherwise shown on the Drawings.

All disturbed non-paved areas shall be sodded.

1.02 SUBMITTALS

A. Provide technical data as per Section 01300 for all materials and installation procedures required under this Section.

B. Submit certifications for all sodding supplied on the project.

1.03 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver sod on pallets.

B. Protect roots from exposure to wind or sun. Protect sod against dehydration, contamination and heat during transportation and delivery.

C. Sod shall be delivered and installed within a 24-hour period.

D. Keep sod stored in the shade or covered with moistened burlap.

E. After installation provide water to establish and maintain the sod.

1.04 WARRANTY

A. The CONTRACTOR shall guarantee sod for a period of 90 days after date of final completion.

PART 2 – PRODUCTS

2.01 MATERIAL

A. Sod shall be Argentine Bahia. The sod shall be live, fresh, and uninjured at the time of planting and shall have a thick mat of roots with enough adhering soil to assure growth. Apply sod within 48 hours of cutting or stack and keep moist. Do not plant dormant sod or if ground is frozen.

B. Placement: Prepare the ground by loosening the soil. Place sod on the prepared soil to form a solid mass with tightly fitted joints. Butt ends and sides of sod strips; do not overlap. Stagger strips to avoid a continuous downhill seam. Tamp or roll lightly to ensure contact with subgrade. Tamp the outer edges of the sodded area to produce a smooth contour. Work sifted soil into minor cracks between pieces of sod; remove excess to avoid smothering of adjacent grass. Water sod thoroughly with a fine spray immediately after planting.

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C. Watering: Keep sod continuously moist to a depth below the root zone for three weeks after placement. If there is not water available to the site, the CONTRACTOR shall provide the water for the sod.

D. Maintenance: Maintain sod by watering, fertilizing, weeding, mowing, trimming and other operations such as rolling, re-grading, and re-planting as required to establish a lawn free of eroded or bare areas and acceptable to the ENGINEER. Where inspected work and materials do not comply with requirements, replace rejected work and continue maintenance until re-inspected by ENGINEER and found to be acceptable. Remove rejected materials promptly from the project site.

END OF SECTION 02910

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SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1- GENERAL

1.01 SCOPE OF WORK

A. Description of scope and intent:
   1. CONTRACTOR shall provide all material, labor, and tools required to complete the installation of specified system.
   2. Any omission of reference to items required to complete the full operational and functional system specified in the section does not relieve the CONTRACTOR of the obligation to provide same.
   3. To provide installation of all items, including delivery, dispersing to the proper locations within the building, and affixing in place.
   4. Installation shall be accomplished by workers skilled in their craft that will perform their work in a professional manner and will leave the premises safe, orderly and clean.
   5. Drawings and general provisions of Contract, including DBIA Agreement Documents and Division 1 Specification Sections, apply to this Section.
   6. CONTRACTOR is responsible for coordination of work included in this specification with all other specification sections related to furnishing of all materials, labor, permits, fees and services necessary for completion of work in this section.

B. Section Includes:
   1. Formwork for cast-in-place concrete, with shoring, bracing, and anchorage.
   2. Formwork accessories.
   3. Form stripping.
   4. Reinforcing steel for cast-in-place concrete.
   5. Grout.
   6. Cast-in-place concrete, including concrete for the following:
      a. Foundations, footings.
      b. Slabs on grade.
      c. Supported slabs.
      d. Foundation and structural walls.
      e. Equipment pads and bases.
   7. Concrete curing.
   8. Shoring and reshoring.

1.02 REFERENCES

All referenced standards refer to the edition in force at the time these plans and Specifications are issued for bidding.

A. AASHTO M 182 Standard Specification for Burlap Cloth Made from Jute or Kenaf; American Association of State Highway and Transportation Officials.

B. ACI 117 Standard Tolerances for Concrete Construction and Materials; American Concrete Institute.

C. ACI 201.2R Guide to Durable Concrete; American Concrete Institute.

D. ACI 211.1 Standard Practice for Selecting Proportions for Normal, Heavyweight, and

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Mass Concrete; American Concrete Institute.

E. ACI 214 Recommended Practice for Evaluation of Compression Test Results of Field Concrete.

F. ACI 301 Specifications for Structural Concrete for Buildings; American Concrete Institute.

G. ACI 302.1R Guide for Concrete Floor and Slab Construction; American Concrete Institute.

H. ACI 304R Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute.

I. ACI 305R Hot Weather Concreting; American Concrete Institute.

J. ACI 306R Cold Weather Concreting; American Concrete Institute.

K. ACI 318 Building Code Requirements for Reinforced Concrete; American Concrete Institute.

L. ACI 347R Guide to Formwork for Concrete; American Concrete Institute.

M. ACI 350 Code Requirements for Environmental Engineering Concrete Structures.

N. ACI 350.1 Specification for Tightness Testing of Environmental Engineering Concrete Containment Structures & Commentary

O. ACI 372 Guide to Design and Construction of Circular Wire-and-Strand-Wrapped Prestressed Concrete Structures

P. ACI SP 66 ACI Detailing Manual; American Concrete Institute.

Q. ASTM A 615 Standard Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement.

R. ASTM A 1064 Standard Specification for Steel Welded Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete

S. ASTM C 31 Standard Practice for Making and Curing Concrete Test Specimens in the Field.

T. ASTM C 33 Standard Specification for Concrete Aggregates.

U. ASTM C 39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

V. ASTM C 42 Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

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W. ASTM C 94 Standard Specification for Ready Mixed Concrete.

X. ASTM C 143 Standard Test Method for Slump of Hydraulic Cement Concrete.

Y. ASTM C 150 Standard Specification for Portland Cement.

Z. ASTM C 171 Standard Specifications for Sheet Materials for Curing Concrete.

AA. ASTM C 172 Standard Practice for Sampling Freshly Mixed Concrete.

BB. ASTM C 173 Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

CC. ASTM C 231 Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

DD. ASTM C 260 Standard Specifications for Air Entraining Admixtures for Concrete.

EE. ASTM C 494 Standard Specifications for Chemical Admixtures for Concrete.

FF. ASTM C 595 Standard Specifications for Blended Hydraulic Cements.

GG. ASTM C 618 Standard Specifications for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.

HH. ASTM C 685 Standard Specifications for Concrete Made by Volumetric Batching and Continuous Mixing.

II. ASTM C 881 Standard Specification for Epoxy Resin Base Bonding Systems for Concrete.

JJ. ASTM C 1059 Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.

KK. ASTM C 1107 Standard Specification for Packaged Dry, Hydraulic Cement Grout (Nonshrink).

LL. ASTM D 1751 Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

MM. ASTM D 1752 Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

NN. ASTM E 154 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth under Concrete Slabs, on Walls, or as Ground Cover.

OO. ASTM E 329 Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.

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PP. CRSI Manual of Standard Practice; Concrete Reinforcing Steel Institute.

QQ. Florida Building Code – FBC

1.03 DEFINITIONS

A. Unexposed Finish: A general use finish, with no appearance criteria, applicable to all formed concrete concealed from view after completion of construction.

B. Exposed Finish: A general use finish applicable to all formed concrete exposed to view except those indicated to receive textured finish, and including surfaces which may receive a paint coating (if any).

1.04 SUBMITTALS

A. All submittals shall be submitted in accordance with Section 01300.

B. Product Data: Submit manufacturer's product data for the following:
   1. Formwork accessories.
   2. Form liners.
   3. Concrete admixtures.
   4. Grout.
   5. Bonding compound.
   6. Epoxy bonding system

C. Aggregates: Submit test reports showing compliance with specified quality and gradation.

D. Shop Drawings: Submit shop drawings for fabrication and placement of the following:
   1. Reinforcement: Comply with ACI SP 66. Include bar schedules, diagrams of bent bars, arrangement of concrete reinforcement, and splices.
      a. Show construction joints.
      b. Include details of reinforcement at openings through concrete structures.
      c. Include elevations of reinforcement in walls.
      d. Show stirrup spacing.
      e. Concrete embedments.
   2. Shoring and reshoring for elevated concrete placement shall include:
      a. Location, size, and type of all shoring members.
      b. Location, size, and type of all reshoring members.
      c. Location, size, and type of all mud sills, blocking, temporary lateral bracing and other accessories necessary to safely support and brace the structure during construction.
      d. Prepare shop drawings under seal of Professional Structural Engineer registered in the state of Florida.

E. Quality Control Submittals
   1. Submit the following information related to quality assurance requirements specified:
   2. Design data: Submit proposed mix designs and test data before concrete

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operations begin. Identify for each mix submitted the method by which proportions have been selected.
   a. For mix designs based on trial mixtures, include trial mix proportions, test results, and graphical analysis and show required average compressive strength f(cr).
   b. Indicate quantity of each ingredient per cubic yard of concrete.
   c. Indicate type and quantity of admixtures proposed or required.
3. Test reports: Submit laboratory test reports for all testing specified.
4. Certifications: Submit affidavits from an independent testing agency certifying that all materials furnished under this section conform to specifications.
5. Certifications: Provide certification from manufacturers of concrete admixtures that chloride content complies with specified requirements.
6. Certifications: Submit mill test certificates for all reinforcing steel furnished under this section, showing physical and chemical analysis.
7. Placement schedule: Submit concrete placement schedule prior to start of any concrete placement operations. Include location of all joints indicated on drawings, plus anticipated construction joints.
8. Submit batch tickets complying with ASTM C 685 or delivery tickets complying with ASTM C 94, as applicable, for each load of concrete used in the work.
   a. Include on the tickets the additional information specified in the ASTM document.
9. Cold weather concreting: Submit description of planned protective measures.
10. Hot weather concreting: Submit description of planned protective measures.
11. Mass Concrete: Submit description of planned protective measures.

1.05 QUALITY ASSURANCE

A. Codes and Standards: Comply with the following documents, except where requirements of the contract documents or of governing codes and governing authorities are more stringent:
   1. ACI 301
   2. ACI 318
   3. ACI 350
   4. CRSI Manual of Standard Practice.

B. Testing Agency Services:
   1. Employ, at CONTRACTOR's expense, an independent testing agency acceptable to the ENGINEER to perform specified tests and other services required for quality assurance.
      a. Testing agency shall meet ASTM E 329 requirements.

C. Source of Materials: Obtain materials of each type from same source for the entire project.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver reinforcement to project site bundled and tagged with metal tags indicating bar size, lengths, and other data corresponding to information shown on placement drawings.
   1. Concrete reinforcement materials stored on the site shall be kept on concrete blocks and supported off the ground to prevent damage and accumulation of water, dirt, or rust.

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B. Store cementitious materials in a dry, weather tight location. Maintain accurate records of shipment and use.

C. Store aggregates to permit free drainage and to avoid contamination with deleterious matter or other aggregates. When stockpiled on ground, discard bottom 6 inches of pile.

D. Handle aggregates to avoid segregation.

1.07 PROJECT CONDITIONS

A. Cold Weather Concreting: Comply fully with the recommendations of ACI 306.
   1. Well in advance of proposed concreting operations, advise the ENGINEER of planned protective measures including but not limited to heating of materials, heated enclosures, and insulating blankets.

B. Hot Weather Concreting: Comply fully with the recommendations of ACI 05R.
   1. Well in advance of proposed concreting operations, advise the ENGINEER of planned protective measures including but not limited to cooling of materials before or during mixing, placement during evening to dawn hours, fogging during finishing and curing, shading, and windbreaks.

C. Mass Concrete: Comply fully with the recommendations of ACI 207.1 R.
   1. Well in advance of proposed concreting operations, advise the ENGINEER of planned protective measures including but not limited to cooling of materials before or during mixing, placement, curing, forms, height of lifts (max 8ft), and monitoring.

PART 2- PRODUCTS

2.01 FORMWORK

A. Facing Materials:
   1. Unexposed finish concrete: Any standard form materials that produce structurally sound concrete.
   2. Exposed finish concrete: Materials selected to offer optimum smooth, stain free final appearance and minimum number of joints. Provide materials with sufficient strength to resist hydrostatic head without bow or deflection in excess of allowable tolerances.
   3. Textured finish concrete: Materials or linings as indicated on the drawings, or as required to match ENGINEER’s control sample.

B. Formwork Accessories:
   1. Form coating: Form release agent that will not adversely affect concrete surfaces or prevent subsequent application of concrete coatings.
   2. Metal ties: Commercially manufactured types; cone snap ties, taper removable bolt, or other type which will leave no metal closer than 1-1/2 inches from surface of concrete when forms are removed, leaving not more than a 1 inch diameter hole in concrete surface.
   3. Fillets: Wood or plastic fillets for chamfered corners, in maximum lengths possible.

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2.02 REINFORCING MATERIALS

A. Reinforcing Bars: Provide deformed bars complying with the following, except where otherwise indicated:
   1. ASTM A 615, Grade 60.

B. Welded Wire Fabric: ASTM A 1064, cold drawn steel, plain.

C. Reinforcing Accessories:
   1. Tie wire: Black annealed type, 16 1/2 gage or heavier.
   2. Supports: Bar supports conforming to specifications of CRSI "Manual of Standard Practice."
      a. Class 1 (plastic protected) at all formed surfaces which will be exposed to weather.
      b. Class 1 (plastic protected) or Class 2 (stainless steel protected) at all formed surfaces which will be exposed to view but not to weather.
      c. Precast concrete blocks of strength equal to or greater than specified strength of concrete or Class 3 supports equipped with sand plates, where concrete will be cast against earth. Concrete masonry units will not be accepted.

2.03 CONCRETE MATERIALS

A. Portland-Limestron Cement: ASTM C 595, and as follows:
   1. Type IL, except where other type is specifically
B. Portland Cement: ASTM C 150, and as follows:
   1. Type I/II, shall be used for moderate sulfate resistance conditions, retaining walls and exposed concrete not included in Type V below and when hot weather concreting is required. Type I/II - Combination of Type I and Type II. Type I/II is a substitute for Type IL cement.
   2. Type III shall be used for high early strength and when cold weather concreting is required.
   3. Type IV shall be used for low heat of hydration when mass concreting is required.
      Type V shall be used for high sulfate resistance conditions, all environmental and all water or wastewater liquid retaining structures (includes all wet well surfaces).
C. Fly Ash: ASTM C 618, Type C or F.

D. Water: Potable.

E. Aggregates:
   1. Normal weight concrete: ASTM C 33.
      a. Class 5M.
      b. Gradation as specified below under mix design.

F. Admixtures General: Admixtures which result in more than 0.1 percent of soluble chloride ions by weight of cement are prohibited.

G. Air Entraining Admixture: ASTM C 260 and certified by manufacturer for compatibility

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with other mix components.

1. Products: The following products, provided they comply with requirements of the contract documents, will be among those considered acceptable:
   a. “Air Mix"; The Euclid Chemical Company.
   b. “Sika Aer"; Sika Corporation.
   c. “Micro Air"; Master Builders, Inc.
   d. “Darex AEA"; W. R. Grace & Co.

H. Water Reducing, Retarding Admixture: ASTM C 494, Type D.

1. Products: The following products, provided they comply with requirements of the contract documents, will be among those considered acceptable:
   a. “Pozzolith Retarder"; Master Builders, Inc.
   b. “Eucon Retarder 75"; The Euclid Chemical Company.
   c. “Daratard 17"; W. R. Grace & Co.
   d. “PSI R Plus"; Cormix Construction Chemicals.
   e. “Plastiment"; Sika Corporation.
   f. “Protard”; Master Builders, Inc. (former Conchem product).

I. Water Reducing and Accelerating Admixtures: ASTM C 494, Type E.

1. Products: The following products, provided they comply with requirements of the contract documents, will be among those considered acceptable:
   a. “Accelguard 80"; The Euclid Chemical Company.
   b. “Pozzutec 20"; Master Builders, Inc.
   c. “Gilco Accelerator"; Cormix Construction Chemicals.

J. High Range Water Reducing Admixture (Superplasticizer): ASTM C 494, Type F or G.

1. Products: The following products, provided they comply with requirements of the contract documents, will be among those considered acceptable:
   a. “WRDA 19" or "Daracem 100"; W. R. Grace & Co.
   b. “PSP Superplasticizer"; Master Builders, Inc. (former Conchem product).
   c. “Sikament 300"; Sika Corporation.
   d. “Eucon 37"; The Euclid Chemical Company.
   e. “PSI Super”; Cormix Construction Chemicals.
   f. “Rheobuild"; Master Builders, Inc.

2.04 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Vapor Retarder: Membrane for installation beneath slabs on grade, resistant to decay when tested in accordance with ASTM E 154, and as follows:

1. Polyethylene sheet, not less than 20 mils thick.

B. Nonshrink Grout: ASTM C 1107.

1. Minimum 4000 psi grout compressive strength
2. Type: Provide nonmetallic type only.
3. Products: The following products, provided they comply with requirements of the contract documents, will be among those considered acceptable:
   a. Nonmetallic type:
      1) “Masterflow 928"; Master Builders, Inc.
      2) “Sonogrout 14k"; Sonneborn Building Products Division ChemRex, Inc.
      3) “Euco N S Grout"; The Euclid Chemical Company.

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4) “Supreme"; Cormix Construction Chemicals.
5) “Five Star Grout"; Five Star Products, Inc.

C. Burlap: AASHTO M 182, Class 2 jute or kenaf cloth.

D. Moisture Retaining Cover: ASTM C 171, and as follows:
1. Curing paper.
2. Polyethylene film.
3. White burlap polyethylene sheeting.

E. Bonding Compound: Non redispersable acrylic bonding admixture, ASTM C 1059, Type II.
1. Products: The following products, provided they comply with requirements of the contract documents, will be among those considered acceptable:
a. “Everbond"; L & M Construction Chemicals, Inc.
b. “Flex Con"; The Euclid Chemical Company.

F. Epoxy Bonding Systems: Epoxy adhesive for bonding fresh concrete to hardened concrete and for grouting wall pipes, bolts and reinforcing dowels. ASTM C 881; type, grade, and class as required for project conditions.
1. Products: The following products, provided they comply with requirements of the contract documents, will be among those considered acceptable:
a. “Concresive LPL"; Master Builders, Inc.
b. “Sikadur 32 Hi Mod"; Sika Corporation.
c. “Euco #452 Epoxy System"; The Euclid Chemical Company.
d. “Sikastix 390”.
e. “EucoEpoxy 461”.
f. “Five Star Epoxy Grout”.
g. “Sikstix 370”.
h. “EucoEpocy 463”.

G. Expansion Joint Filler
1. Expansion Joint Filler shall be performed non-extruding and resilient type meeting the Specifications of ASTM D1751, or D1752, unless otherwise specified.
2. All expansion joints in base slabs on grade other than hydraulic structures shall be fiber expansion joints of required slab depth meeting the requirement of ASTM D1751, Type I and AASHTO M213. Exposed joints shall be sealed as specified below.
3. All expansion joints in hydraulic structures shall be ¾ inch sponge rubber expansion joints of required wall thickness meeting the requirements of ASTM D1752, Type I and AASHTO M153, Type I. Joints shall be sealed on both sides as specified below.
a. Nonextruding bituminous type: ASTM D 1751.
b. Sponge rubber type: ASTM D 1752, Type I.

H. Expansion Joint Sealer
1. Joint sealants for hydraulic structures shall be one of the following, or approved equal:
a. “CM-60” two-part gray tone, as manufactured by W. R. Meadows, Inc., applied over a backer rod sized for the joint. Underwater primer shall be used on all joints subject to immersion. Standard “CM-60” primer shall be applied to all other joints. Sealant depth shall be one-half the width of the

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joint.

b. The sealant shall be a two-part, polyurethane sealant “Eucolastic I” by the Euclid Chemical Company or “Sikaflex 1a” by Sika Chemical Company. Joint width should be 4 times the expected joint movement, but not less than ¼ inch. All joints shall be primed with “Eucolastic Primer” by the Euclid Chemical Company or “Sikaflex 429” by Sika Chemical Company.

I. PVC Waterstops

Waterstops: Made of Polyvinyl Chloride (PVC) and of subzero grade, Plastigrip, Type W-6 as manufactured by Progress Unlimited, Inc. or approved equivalent.

1. Minimum 4 inch x 3/16 inch or as specified on the drawings.
2. Produced from a compound, the base resin of which shall be virgin PVC.
3. Minimum Properties:
   a. 2000 psi minimum tensile strength, ASTM D412-51T
   b. 350% minimum elongation, ASTM D412-51T
   c. -35 degrees F minimum low temperature brittleness, ASTM D746-57T
   d. 65-75 shore ‘A’ durometer hardness, ASTM D676-59T
   e. 0.15 maximum water absorption, ASTM D570-59T
4. Field Splicing:
   a. Butt splices shall be fused welded using a thermostatically controlled Teflon PVC Waterstop iron at the Manufacturer’s recommended temperature
   b. Lapping, gluing or use of adhesives shall not be permitted.
   c. Provide factory made waterstop fabrications for all changes of directions, intersections, and transitions leaving only butt joint splicing for the field.
5. Center waterstop in the joint and secure in correct position.
6. Use ribbed center bulb for all moving joints. Use dumbbell for all non-movement joints.
7. Always place the center bulb in the center of the expansion joint. Do not embed the center bulb in concrete.
8. Vibrate concrete around waterstops thoroughly to prevent honeycombing and to ensure contact between concrete and waterstop.

2.05 CONCRETE MIX DESIGN

A. Review: Do not begin concrete operations until proposed mix has been reviewed by the ENGINEER.

B. Proportioning of Normal Weight Concrete: Comply with recommendations of ACI 211.1.

C. Required Average Strength: Establish the required average strength f(cr) of the design mix on the basis of trial mixtures as specified in ACI 301, and proportion mixes accordingly. Employ an independent testing agency acceptable to the ENGINEER for preparing and reporting proposed mix design.

D. Proportion normal-weight concrete mix to produce an average strength at 28-day as follows unless otherwise indicated on the drawings:

1. Columns, beams, walls, footings and slabs: 4000 psi
2. Masonry Filled Grout: 3000 psi
3. Prestressed and precast elements: 4000 psi

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4. Concrete Overflow Structure: 4000 psi
5. Prestressed Elements: 5000 psi
6. Prestressed Concrete Tank – Refer to Specification 13216

E. Fly Ash:
   1. The CONTRACTOR may elect to replace a portion of the Portland cement with fly ash up to a maximum of 25 percent by weight of cement plus fly ash.

F. Admixtures:
   1. Air entraining admixture: Add at rate to achieve specified air content.
      a. Do not use in slabs on grade scheduled to receive topping, unless manufacturer of topping recommends use over air entrained concrete.
   2. Water reducing and retarding admixture: Add as required in concrete mixes to be placed at ambient temperatures above 90 degrees F.
   3. Water reducing and accelerating admixture: Add as required in concrete mixes to be placed at ambient temperatures below 50 degrees F.
   4. High range water reducing admixture (superplasticizer): Add as required for placement and workability.
   5. Do not use admixtures not specified or approved.

G. Design mix to meet or exceed each requirement specified. Where more than one criterion is specified, the most stringent shall apply. For example, a minimum cement content or maximum water cement ratio might result in strengths greater than the minimum specified; likewise, a greater cement content or lower water cement ratio may be required in order to achieve the required strength.
   1. Specified compressive strength f'(c) (ASTM C 39): As noted
   2. Maximum water cement ratio by weight:
      a. 0.4 for concrete toppings subject to traffic
      b. 0.45 for all other concrete
   3. Maximum slump: As recommended in ACI 211.1. and ACI 350 as applicable.
   4. Gradation of coarse aggregate: ASTM C 33 standard gradation with maximum nominal size of 3/4 inches.
   5. Total air content (ASTM C 173 or ASTM C 231): 5 percent.

H. Mix Adjustments: Provided that no additional expense to OWNER is involved, CONTRACTOR may submit for ENGINEER’s approval requests for adjustment to approved concrete mixes when circumstances such as changed project conditions, weather, or unfavorable test results occur. Include laboratory test data substantiating specified properties with mix adjustment requests.

2.06 CONTROL OF MIX IN THE FIELD

A. Slump: A tolerance of up to 1 inch above that specified will be permitted for 1 batch in 5 consecutive batches tested. Concrete of lower slump than that specified may be used, provided proper placing and consolidation is obtained.
   1. If slump upon arrival at the site is lower than 1 inch below the value specified, one addition of water in accordance with ASTM C 94 will be permitted to bring slump within tolerance, provided that:
      a. A positive means is available to measure the amount of water added at the site.
      b. The specified (or approved) maximum water cement ratio is not exceeded.

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c. Not more than 45 minutes have elapsed since batching.

B. Total Air Content: A tolerance of plus or minus 1 1/2 percent of that specified will be allowed for field measurements.

C. Do not use batches that exceed tolerances.

2.07 CONCRETE MIXING

A. On Site Equipment: Mix concrete materials in appropriate drum type batch machine mixer, in compliance with ASTM C 685. Mix each batch minimum of 1 1/2 minutes and maximum of 5 minutes before discharging concrete. Clean thoroughly at end of day and before changing concrete type.

B. Transit Mixers: Mix concrete materials in transit mixers, complying with requirements of ASTM C 94.
1. At ambient temperatures of 85 to 90 degrees F, reduce mixing and delivery time to 75 minutes.
2. At ambient temperatures above 90 degrees F, reduce mixing and delivery time to 60 minutes.

PART 3- EXECUTION

3.01 CONCRETE FORM PREPARATION

A. General: Comply with requirements of ACI 301 for formwork, and as herein specified. The CONTRACTOR is responsible for the design, Engineering, and construction of formwork, and for its timely removal.

B. Earth Forms: Hand trim bottoms and sides of earth forms to profiles indicated on the drawings. Remove loose dirt before placing concrete.

C. Design: Design and fabricate forms for easy removal, without impact, shock, or damage to concrete surfaces or other portions of the work. Design to support all applied loads until concrete is adequately cured, within allowable tolerances and deflection limits.

D. Construction: Construct and brace formwork to accurately achieve end results required by contract documents, with all elements properly located and free of distortion. Provide for necessary openings, inserts, anchorages, and other features shown or otherwise required.
1. Joints: Minimize form joints and make watertight to prevent leakage of concrete.
   a. Align joints symmetrically at exposed conditions.
2. Chamfers: Provide chamfered edges and corners at exposed locations, unless specifically indicated otherwise on the drawings.
3. Permanent openings: Provide openings to accommodate work of other trades, sized and located accurately. Securely support items built into forms; provide additional bracing at openings and discontinuities in formwork.
4. Temporary openings: Provide temporary openings for cleaning and inspection in most inconspicuous locations at base of forms, closed with tight fitting panels designed to minimize appearance of joints in finished concrete work.

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E. Tolerances for Formed Surfaces: Comply with minimum tolerances established in ACI 117, unless more stringent requirements are indicated on the drawings.

F. Release Agent: Provide either form materials with factory applied non-absorptive liner or field applied form coating. If field applied coating is employed, thoroughly clean and recondition formwork and reapply coating before each use. Rust on form surfaces is unacceptable.

3.02 VAPOR RETARDER INSTALLATION

A. General: Place vapor retarder sheet over prepared base material, aligning longer dimension parallel to direction of pour and lapped 6 inches. Seal joints with appropriate tape. Cover with sand to depth shown on drawings.

3.03 PLACING REINFORCEMENT

A. General: Comply with requirements of ACI 301 and as herein specified.

B. Preparation: Clean reinforcement of loose rust and mill scale, soil, and other materials which adversely affect bond with concrete.

C. Placement: Place reinforcement to achieve not less than minimum concrete coverages required for protection. Accurately position, support, and secure reinforcement against displacement. Provide Class B tension lap splices complying with ACI 318 unless otherwise indicated. Do not field bend partially embedded bars unless otherwise indicated or approved.
   1. Use approved bar supports and tie wire, as required. Set wire ties to avoid contact with or penetration of exposed concrete surfaces. Tack welding of reinforcing is not permitted.
   2. Wire fabric: Install in maximum lengths possible, lapping adjoining pieces not less than one full mesh. Offset end laps to prevent continuous laps in either direction, and splice laps with tie wire.

D. Welding: Welding of reinforcement is not permitted.

3.04 JOINT CONSTRUCTION

A. Construction Joints: Locate and install construction joints as indicated on drawings. If construction joints are not indicated, locate in manner which will not impair strength and will have least impact on appearance, as acceptable to the ENGINEER. Construction joints in retaining walls and walls of concrete tanks or structures subject to hydrostatic pressure shall be intentionally roughened to a full amplitude of approximately ¼ inch.
   1. Keyways: Provide keyways not less than 1 1/2 inches deep.
   2. Reinforcement: Continue reinforcement across and perpendicular to construction joints, unless details specifically indicate otherwise.

B. Isolation Joints: Construct isolation joints in slabs poured on grade at points of contact with vertical components, such as foundation walls and column pedestals. Install expansion joint filler to full concrete depth. Recess top edge of filler 1/8 inch where joints are unsealed.

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C. Expansion Joints: Construct expansion joints where indicated. Install expansion joint filler to full depth of concrete. Recess edge of filler to depth indicated to receive joint sealant and backer rod as specified herein and detailed on drawings.

D. Control Joints: Construct contraction joints in building slabs poured on grade to form panels of sizes indicated on drawings, but not more than 20 feet apart in either direction.
   1. Saw cuts: Form control joints by means of saw cuts one fourth the depth of the slab, performed as soon as possible after slab finishing without dislodging aggregate.

3.05 INSTALLATION OF EMBEDDED ITEMS

A. General: Set anchorage devices and other items required for other work connected to or supported by cast-in-place concrete, using templates, setting drawings, and instructions from suppliers of items to be embedded.
   1. Edge Forms and Screeds: Set edge forms and intermediate screeds as necessary to achieve final elevations indicated for finished slab surfaces.

3.06 WATERSTOPS

A. Waterstops shall be provided at all joints to seal off leakage of liquid from or into concrete tanks or structures subject to hydrostatic pressures. The type of waterstops used shall be as shown on the Drawings and as specified herein. The CONTRACTOR shall submit to the ENGINEER for approval the proposed procedure and schedule of his concrete placing operations along with a detailed layout of the waterstop materials required showing sizes, lengths and types of joints.

B. Where required for proper location of waterstops, whether shown on the Drawings or not, starter walls of up to 1-1/2 inches in height and monolithic with slabs shall be provided at all wall construction joints. Reinforcing steel shall not be depressed at waterstops, but shall have only the amount of concrete covering shown or specified. Starter walls as specified shall be required whether shown on the Drawings or not, unless specified concrete cover over reinforcing steel is 3 inches or greater.

3.07 CONCRETE PLACEMENT

A. Preparation: Provide materials necessary to ensure adequate protection of concrete during inclement weather before beginning installation of concrete.

B. Inspection: Before beginning concrete placement, inspect formwork, reinforcing steel, and items to be embedded, verifying that all such work has been completed.
   1. Wood forms: Moisten immediately before placing concrete in locations where form coatings are not used.

C. Placement General: Comply with requirements of ACI 304 and as follows:
   1. Concreting should be carried on at such a rate that the concrete is at all times plastic and flows readily into spaces between reinforcement.
   2. Schedule continuous placement of concrete to prevent the formation of cold joints.
   3. Provide construction joints if concrete for a particular element or component

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cannot be placed in a continuous operation.

4. Deposit concrete as close as possible to its final location, to avoid segregation.
5. Concrete shall be worked around reinforcement and embedded fixtures and into corners of forms.

6. The following shall be prohibited from use:
   a. Partially hardened concrete.
   b. Contaminated concrete.
   c. Re-tempered concrete.
   d. Re-mixed concrete after initial set has occurred.

D. Placement in Forms: Limit horizontal layers to depths which can be properly consolidated, but in no event greater than 24 inches.
   1. Consolidate concrete by means of mechanical vibrators, inserted vertically in freshly placed concrete in a systematic pattern at close intervals. Penetrate previously placed concrete to ensure that separate concrete layers are knitted together.
   2. Vibrate concrete sufficiently to achieve consistent consolidation without segregation of coarse aggregates.
   3. Do not use vibrators to move concrete laterally.

E. Slab Placement: Schedule continuous placement and consolidation of concrete within planned construction joints.
   1. Thoroughly consolidate concrete without displacing reinforcement or embedded items, using internal vibrators, vibrating screeds, roller pipe screeds, or other means acceptable to ENGINEER.
   2. Strike off and level concrete slab surfaces, using highway straightedges, darbies, or bull floats before bleed water can collect on surface. Do not work concrete further until finishing operations are commenced.

F. Cold Weather Placement: Comply with recommendations of ACI 306 when air temperatures are expected to drop below 40 degrees F either during concrete placement operations or before concrete has cured.
   1. Do not use frozen or ice laden materials.
   2. Do not place concrete on frozen substrates.

G. Hot Weather Placement: Comply with recommendations of ACI 305R when ambient temperature before, during, or after concrete placement is expected to exceed 90 degrees F or when combinations of high air temperature, low relative humidity, and wind speed are such that the rate of evaporation from freshly poured concrete would otherwise exceed 0.2 pounds per square foot per hour.
   1. Do not add water to approved concrete mixes under hot weather conditions.
   2. Provide mixing water at lowest feasible temperature, and provide adequate protection of poured concrete to reduce rate of evaporation.
   3. Use fog nozzle to cool formwork and reinforcing steel immediately prior to placing concrete.

H. Mass Concrete Placement: Comply with recommendations of ACI 207.1R when any volume of concrete with dimensions large enough to require that measures be taken to cope with generation of heat from hydration of the cement and attendant volume change to minimize cracking.

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1. When the minimum dimension of the concrete exceeds 36 inches and the ratio of volume of concrete to the surface area is greater than 12 inches, provide for mass concrete.
2. Lifts shall not exceed 8 ft.

3.08 FINISHING FORMED SURFACES

A. Repairs, General: Repair surface defects, including tie holes, immediately after removing formwork.
   1. Remove honeycombed areas and other defective concrete down to sound concrete, cutting perpendicular to surface or slightly undercutting. Dampen patch location and area immediately surrounding it prior to applying bonding compound or patching mortar.

   2. Before bonding compound has dried, apply patching mixture matching original concrete in materials and mix except for omission of coarse aggregate, and using a blend of white and normal portland cement as necessary to achieve color match. Consolidate thoroughly and strike off slightly higher than surrounding surface.

B. Textured Form Finish: Repair tie holes and patch defective areas to match pattern created by form construction or form liners.

C. Unexposed Form Finish: Repair tie holes and patch defective areas. Rub down or chip off fins or other raised areas exceeding ¼-inch height.

D. Exposed Form Finish: Repair and patch defective areas, with fins or other projections completely removed and smoothed.
   1. Smooth rubbed finish: Apply to surfaces indicated no later than 24 hours after form removal.
      a. Wet concrete surfaces to be finished and rub with Carborundum brick or other abrasive until uniform color and texture are achieved.
      b. Do not apply separate grout mixture.
   2. Contiguous unformed surfaces: Strike smooth and float to a similar texture tops of walls, horizontal offsets, and other unformed surfaces adjacent to or contiguous with formed surfaces. Continue final finish of formed surfaces across unformed surfaces, unless otherwise specifically indicated.

3.09 FINISHING SLABS

A. Finishing Operations General:
   1. Do not directly apply water to slab surface or dust with cement.
   2. Use hand or powered equipment only as recommended in ACI 302.1R.
   3. Screeding: Strike off to required grade and within surface tolerances indicated. Verify conformance to surface tolerances. Correct deficiencies while concrete is still plastic.
   4. Bull Floating: Immediately following screeding, bull float or darby before bleed water appears to eliminate ridges, fill in voids, and embed coarse aggregate. Recheck and correct surface tolerances.
   5. Do not perform subsequent finishing until excess moisture or bleed water has disappeared and concrete will support either foot pressure with less than ¼-

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inch indentation or weight of power floats without damaging flatness.

6. Final floating: Float to embed coarse aggregate, to eliminate ridges, to compact concrete, to consolidate mortar at surface, and to achieve uniform, sandy texture. Recheck and correct surface tolerances.

B. Coordinate appearance and texture of required final finishes with the ENGINEER before application.
   1. Apply final finishes in the locations indicated on the drawings.

C. Float Finish: As specified above.

D. Broomed Float Finish: After floating and when water sheen has practically disappeared, apply uniform transverse corrugations approximately 1/16-inch deep, without tearing surface.

E. Slab Surface Tolerances:
   1. Achieve flat, level planes except where grades are indicated. Slope uniformly to drains.
   2. Floated finishes: Depressions between high spots shall not exceed 5/16 inch under a 10-foot straightedge.

F. Repair of Slab Surfaces: Test slab surfaces for smoothness and to verify surface plane to tolerance specified. Repair defects as follows:
   1. High areas: Correct by grinding after concrete has cured for not less than 14 days.
   2. Low areas: Immediately after completion of surface finishing operations, cut out low areas and replace with fresh concrete. Finish repaired areas to blend with adjacent concrete. Proprietary patching compounds may be used when approved by the ENGINEER.
   3. Crazed or cracked areas: Cut out defective areas, except random cracks and single holes not exceeding 1 inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts. Dampen exposed concrete and apply bonding compound. Mix, place, compact, and finish patching concrete to match adjacent concrete.
   4. Isolated cracks and holes: Groove top of cracks and cut out holes not over 1 inch in diameter. Dampen cleaned concrete surfaces and apply bonding compound; place dry pack or proprietary repair compound acceptable to ENGINEER while bonding compound is still active:
      a. Dry pack mix: One part Portland cement to 2-1/2 parts fine aggregate and enough water as required for handling and placing.
      b. Install patching mixture and consolidate thoroughly, striking off level with and matching surrounding surface. Do not allow patched areas to dry out prematurely.

3.10 CONCRETE CURING AND PROTECTION

A. General:
   1. Prevent premature drying of freshly placed concrete, and protect from excessively cold or hot temperatures until concrete has cured.
   2. Provide curing of concrete by one of the methods listed and as appropriate to service conditions and type of applied finish in each case.

B. Curing Period:
   1. Not less than 7 days for standard cements and mixes.
   2. Not less than 4 days for high early strength concrete using Type III cement.

C. Curing Temperature:
   1. Concrete shall be maintained above 50 degrees F and in moist condition during the entire curing period.

D. Formed Surfaces: Cure formed concrete surfaces by moist curing with forms in place for full curing period.
   1. Keep wooden or metal forms moist when exposed to heat of the sun.
   2. If forms are removed prior to completion of curing process, continue curing by one of the applicable methods specified.

E. Surfaces Not in Contact with Forms:
   1. Start initial curing as soon as free water has disappeared, but before surface is dry.
   2. Keep continuously moist for not less than 3 days by uninterrupted use of any of the following:
      a. Water ponding.
      b. Water saturated sand.
      c. Water fog spray.
      d. Saturated burlap: Provide 4-inch minimum overlap at joints.
   3. Begin final curing procedures immediately following initial curing and before concrete has dried.
      a. Moisture retaining cover: Lap not less than 3-inches at edges and ends, and seal with waterproof tape or adhesive. Repair holes or tears during curing period with same tape or adhesive. Maintain covering in intimate contact with concrete surface. Secure to avoid displacement.
         1) Extend covering past slab edges at least twice the thickness of slab.
         2) Do not use plastic sheeting on surfaces which will be exposed to view when in service.
         3) Continue final curing to end of curing period.

F. Avoid rapid drying at end of curing period.

G. During and following curing period, protect concrete from temperature changes of adjacent air in excess of 5 degrees F per hour and 50 degrees F per 24 hours. Progressively adjust protective measures to provide uniform temperature changes over entire concrete surface.

3.11 SHORES AND SUPPORTS

A. General: Comply with recommendations of ACI 347 for shoring and reshoring in multistory construction.

B. Low Rise Construction: Extend shoring from ground to roof for structures 4 stories or less in height.

C. Reshoring: Remove shores and reshore in a planned sequence, to avoid damage to partly cured concrete. Locate and provide adequate reshoring to safely support work

without excessive stress or deflection.

D. Provide as a package, shoring and reshoring drawings prepared by or under the direct supervision of a Specialty Engineer registered in the State of Florida.

3.12 REMOVAL OF FORMS AND SUPPORTS

A. Non Load Bearing Formwork: Provided that concrete has hardened sufficiently that it will not be damaged, forms not actually supporting weight of concrete or weight of soffit forms may be removed after concrete has cured at not less than 50 degrees F for 24 hours. Maintain curing and protection operations after form removal.

B. Load Bearing Formwork: Do not remove shoring and forms supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, until concrete has attained at least the specified compressive strength f'(c) and until the CONTRACTOR has determined that the actual compressive strength attained is adequate to support the weight of the concrete and superimposed loads.

C. Keep reshores in place a minimum of 15 days after placing upper tier, and longer if required, until concrete has attained at least the specified compressive strength f'(c) and until the CONTRACTOR has determined that the actual compressive strength attained is adequate to support the weight of the concrete and superimposed loads.

D. Keep supports in place until heavy loads due to construction operations have been removed.

E. Test field cured specimens to determine potential compressive strength of concrete for specific locations.

3.13 MISCELLANEOUS CONCRETE ITEMS

A. Fill in: Fill in holes and openings left in concrete structures for passage of work by other trades after such work is in place. Place such fill in concrete to blend with existing construction, using same mix and curing methods.

B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations, as indicated on Drawings. Set anchor bolts at correct elevations, complying with diagrams or templates of equipment manufacturer.
   1. Grout base plates and foundations as indicated with non-shrink grout.
   2. Use nonmetallic grout for exposed conditions, unless otherwise indicated.
   3. Equipment bases shall be sized to provide a minimum of 1.5” between the edge of the equipment bases and the edge of the equipment being served.
   4. Provide conduit windows through equipment bases of electrical equipment sized no larger than the conduit windows of the equipment being served.
   5. Equipment bases for electrical equipment shall be a minimum of 4” thick with chamfered edges.

C. Reinforced Masonry: Provide concrete grout for reinforced masonry where indicated on Drawings and as scheduled.

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3.14 CONCRETE REPAIRS

A. General: Repairs due to poor workmanship shall be made by the CONTRACTOR at the CONTRACTOR’s expense and shall be approved by the ENGINEER prior to repair procedure being implicated.

B. Perform cosmetic repairs of concrete surfaces as specified under concrete application.

C. Perform structural repairs with prior approval of the ENGINEER for method and procedure, using epoxy bonding systems. The ENGINEER's approval is required for repair methods using materials other than those specified.

3.15 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. Refer to Section 01410 for additional concrete testing requirements for the project.

B. Composite Sampling, and Making and Curing of Specimens: ASTM C 172 and ASTM C 31.
   1. Take samples at point of discharge.
   2. For pumped concrete, perform sampling and testing at the frequencies specified herein at point of delivery to pump, and perform additional sampling and testing at the same frequency at discharge from line.
   3. Results obtained at discharge from line shall be used for acceptance of concrete.

C. Slump: ASTM C 143. One test per strength test and additional tests if concrete consistency changes.
   1. Modify sampling to comply with ASTM C 94.

D. Air Content of Normal Weight Concrete: ASTM C 173 or ASTM C 231. One test per strength test performed on air entrained concrete.

E. Concrete Temperature:
   1. Test hourly when air temperature is 40 degrees F or below.
   2. Test hourly when air temperature is 90 degrees F or above.
   3. Test each time a set of strength test specimens is made.

F. Compressive Strength Tests: ASTM C 39.
   1. Compression test specimens: Mold and cure one set of 4 standard cylinders for each compressive strength test required.
   2. Testing for acceptance of potential strength of as delivered concrete:
      a. Obtain samples on a statistically sound, random basis.
      b. Minimum frequency:
         1) One set per 100 cubic yards or fraction thereof for each day's pour of each concrete class.
         2) One set per 3500 square feet of slab or wall area or fraction thereof for each day's pour of each concrete class.
         3) When the above testing frequency would provide fewer than 5 strength tests for a given class of concrete during the project, conduct testing from not less than 5 randomly selected batches, or from each batch if fewer than 5.

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c. Test one specimen per set at 7 days for information unless an earlier age is required.
d. Test 2 specimens per set for acceptance of strength potential; test at 28 days unless other age is specified. The test result shall be the average of the two specimens. If one specimen shows evidence of improper sampling, molding, or testing, the test result shall be the result of the remaining specimen; if both show such evidence, discard the test result and inform the ENGINEER.
e. Retain one specimen from each set for later testing, if required.
f. Strength potential of as delivered concrete will be considered acceptable if all of the following criteria are met:
    1) No individual test result falls below specified compressive strength by more than 500 psi.
    2) Average of any 3 consecutive strength test results equals or exceeds specified compressive strength.
    3) Testing for evaluation of field curing:
        a) Frequency: 1 field set of specimens per strength acceptance test.
        b) Mold specimens from same sample used for strength acceptance tests. Field cure, and test at same age as for strength acceptance tests.
        c) Evaluate construction and curing procedures and implement corrective action when strength results for field cured specimens are less than 85 percent of test values for companion laboratory cured specimens.

3. Removal of forms or supports: Mold additional specimens and field cure with concrete represented; test to determine strength of concrete at proposed time of form or support removal.

G. Test Results: Testing agency shall report test results in writing to ENGINEER and CONTRACTOR within 24 hours of test.
1. Test reports shall contain the following data:
    a. Project name, number, and other identification.
    b. Name of concrete testing agency.
    c. Date and time of sampling.
    d. Concrete type and class.
    e. Location of concrete batch in the completed work.
    f. All information required by respective ASTM test methods.
2. Nondestructive testing devices such as impact hammer or sonoscope may be used at ENGINEER's option for assistance in determining probable concrete strength at various locations or for selecting areas to be cored, but such tests shall not be the sole basis for acceptance or rejection.
3. The testing agency shall make additional tests of in place concrete as directed by the ENGINEER when test results indicate that specified strength and other concrete characteristics have not been attained.
    a. Testing agency may conduct tests of cored cylinders complying with ASTM C 42, or tests as directed.
    b. Cost of additional testing shall be borne by the CONTRACTOR when unacceptable concrete has been verified.

H. Water Tightness of Water Containing Walls
1. All basins, tanks, manholes, storm drainage structures, and wet wells are

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hydraulic structures and shall be watertight and with zero leakage. Water tightness testing shall be conducted prior to any application of coatings or painting systems to the tank, basin, manhole, or wet well as per Sections 09900 and 03446. Each structure shall be filled with water, full depth (above maximum water level), prior to backfilling (unless otherwise noted) and kept full of water for 48 hours prior to starting the tightness testing. After 48-hours the level in the tank shall be measured and the testing period shall begin and conducted over a 24-hour period. The CONTRACTOR shall exercise every precaution to secure water tightness by careful mixing and placing of the concrete to obtain a homogeneous mixture at maximum density, without air pockets or voids, using the minimum practical amount of water in the mix. Extreme care shall be used to secure continuity of water stops at expansion and construction joints, to seal off holes from wall ties, and when placing concrete about wall sleeves, wall pipes and other obstructions. The CONTRACTOR shall fix all leaks.

2. The CONTRACTOR shall furnish, at his own expense, any pumps, piping, and appurtenances to provide the test water for the water tightness testing and any water post-loading operations of the structures.
3. All structures shall be watertight. CONTRACTOR shall fix all leaks.

END OF SECTION 03300

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SECTION 03310

CONCRETE SEALER

PART 1 - GENERAL

1.01 SUMMARY

A. Description of scope and intent:
   1. CONTRACTOR shall provide all material, labor, and tools required to complete the installation of specified system.
   2. Any omission of reference to items required to complete the full operational and functional system specified in the section does not relieve the CONTRACTOR of the obligation to provide same.
   3. To provide installation of all items, including delivery, dispersing to the proper locations within the building, and affixing in place.
   4. Installation shall be accomplished by workers skilled in their craft who will perform their work in a professional manner and will leave the premises safe, orderly and clean.
   5. Drawings and general provisions of Contract, including the General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section
   6. CONTRACTOR is responsible for coordination of work included in this specification with all other specification sections related to furnishing of all materials, labor, permits, fees and services necessary for completion of work in this section.
   7. In the event of a conflict between the design drawings, referenced standards and these Specifications, the more stringent shall govern unless directed otherwise by the Engineer. CONTRACTOR shall strictly adhere to OSHA requirements and local codes or those of any regulatory agency or body with jurisdiction

B. This Section includes the following:
   1. Sealing for concrete slabs shall be provided in all new buildings including the new electrical building.

1.02 DEFINITIONS

A. Cementitious Materials: Portland cement (concrete) alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

B. See Section 03300, “Cast-In-Place Concrete” for curing of slabs prior to application of concrete sealer.

1.03 SUBMITTALS

A. Submit product data, field quality-control test and inspection reports in accordance with Section 01300.

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1.04 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Testing Agency Qualifications: An independent agency, qualified per ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
   1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, per ACI CP-01 or an equivalent certification program.
   2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Product: Curing and Sealing Concrete Floors Interior floor slabs shall be cured and sealed with “CLEAR BOND” by Guardian Chemical Company of Atlanta or BASF MasterKure CC 180 WB” by Sonneborn Building Products of Minneapolis, or equal.

B. Alternate Basis of Design Product: Subject to compliance with requirements, product that may be incorporated into the Work is Thoroshield by ChemRex, Inc., or equivalent product by an equivalent manufacturer.

C. The use of other products, suitable for traffic, shall meet the requirements of this Section in regards to a clear, water-based urethane protective coating for use as a sealer for a horizontal concrete substrate with a coefficient of friction as required by 7th Edition Florida Building Code Building (2020). The clear, water-based urethane protective coating installation instructions/requirements on new and fresh concrete shall be coordinated with ACI 318 and section 03300.

PART 3 - EXECUTION

3.01 CONCRETE SEALING

A. Two coats shall be applied in accordance with the manufacturer’s printed instructions.

B. New concrete floors shall be cured by applying the first coat as soon as possible after final finishing.

C. Second coat shall be applied when all other trades are completed and structure is otherwise ready for occupancy.

D. Surface Prep: Freshly placed concrete must be properly finished. The surface is application ready when it is damp but not wet and when it cannot be marred by foot

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traffic. Existing concrete surfaces should be thoroughly repaired and cleaned before application. Surface must be clean, dry and free of dust, oil, grease, sealers and all other surface contaminants that might inhibit proper bond of material.

1. First Coat: BASF MasterKure CC 180 WB 200 – 400 sf/g
2. Finish Coat: BASF MasterKure CC 180 WB 400 – 600 sf/g

E. Prepare horizontal concrete surface to receive sealer as recommended by sealer manufacturer.
   1. All concrete surfaces shall be fully cured
   2. Prepare surface by mechanical means to provide a profile.
   3. Use abrasive shot blasting, sand blasting, or grinding with specialty equipment to prepare surface. Preclean by chemical means before using mechanical means.

F. Use a continuous operation for each coat, by soft bristle brush or a ¼ inch nap roller per manufacturer's written instructions. Do not spray.

G. Apply only when surface temperature is above 40 degrees F.

H. Allow a minimum of 4 hours before applying second coat.

3.02 FIELD QUALITY CONTROL

A. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports. Inspections shall take place whenever sealer is being applied to concrete.

B. Inspections:
   1. Confirm sealing procedures and adherence to manufacturer’s recommendations and these specifications.
   2. Verify full coverage of areas to receive concrete sealer.
   3. Inspection results shall be reported in writing to CONTRACTOR within 8 hours of inspection. Reports shall contain Project identification name and number, date of inspection, name of inspector and inspecting agency, results of inspections.
   4. Additional inspecting, at CONTRACTOR's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
   5. Correct deficiencies in the Work that test reports and inspections indicate does not comply with the Contract Documents.

END OF SECTION 03310

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SECTION 05120

STRUCTURAL STEEL

PART 1- GENERAL

1.01 SUMMARY

A. Description of scope and intent:
   1. CONTRACTOR shall provide all material, labor, and tools required to complete the installation of specified system.
   2. Any omission of reference to items required to complete the full operational and functional system specified in the section does not relieve the CONTRACTOR of the obligation to provide same.
   3. To provide installation of all items, including delivery, dispersing to the proper locations within the building, and affixing in place.
   4. Installation shall be accomplished by workers skilled in their craft who will perform their work in a professional manner and will leave the premises safe, orderly and clean.
   5. Drawings and general provisions of Contract, DBIA Agreement Documents and Division 1 Specification Sections, apply to this Section.
   6. CONTRACTOR is responsible for coordination of work included in this specification with all other specification sections related to furnishing of all materials, labor, permits, fees and services necessary for completion of work in this Section.
   7. In the event of a conflict between the Design Drawings, referenced standards and these Specifications, the more stringent shall govern unless directed otherwise by the ENGINEER. CONTRACTOR shall strictly adhere to OSHA requirements and local codes or those of any regulatory agency or body with jurisdiction.

B. Section Includes:
   1. Fabrication and erection of structural steel framing members, as defined in AISC Code and as indicated on the drawings.
   2. Fabrication and erection of architecturally exposed structural steel (AESS).
   3. Welding.
   4. Shop painting.

C. Products Furnished but not installed under this section:
   1. Steel anchorages cast in concrete.
   2. Steel anchorages embedded in masonry.

1.02 REFERENCES

Comply with the following documents, except where requirements of the Contract Documents or of governing codes and governing authorities are more stringent. All referenced standards refer to the edition in force at the time these plans and specifications are issued.

A. ASTM A 36 -- Standard Specification for Structural Steel

B. ASTM A 6 – General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use

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C. ASTM A 123 -- Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

D. ASTM A 307-- Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength

E. ASTM A 325-- Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

F. ASTM A 500-- Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

G. ASTM A 786 – Rolled Steel Floor Plates

H. ASTM A 992 – Specification for Structural Steel Shapes

I. ASTM C 1107-- Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

J. ASTM E 94 -- Standard Guide for Radiographic Testing

K. ASTM E 142-- Standard Method for Controlling Quality of Radiographic Testing

L. ASTM E 164-- Standard Practice for Ultrasonic Contact Examination of Weldments

M. ASTM E 165-- Standard Test Method for Liquid Penetrant Examination

N. ASTM E 709-- Standard Guide for Magnetic Particle Examination

O. ASTM F 959-- Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners

P. AWS D1.1-- Structural Welding Code - Steel; American Welding Society

Q. Code of Standard Practice for Steel Buildings and Bridges; American Institute of Steel Construction, Inc. (AISC)

R. Specification for Structural Steel Buildings -- Allowable Stress Design and Plastic Design; American Institute of Steel Construction, Inc. (AISC)

S. Specification for Structural Joints Using ASTM A325 or A490 Bolts; Research Council on Structural Connections; American Institute of Steel Construction, Inc. (AISC)

T. Steel Structures Painting Manual, Volume 2, Systems and Specifications; Steel Structures Painting Council (SSPC)

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SECTION 05120

STRUCTURAL STEEL

1.03 DEFINITIONS

A. Structural Steel: Items as listed in 2.1 of AISC "Code of Standard Practice for Steel Buildings and Bridges," and excluding steel, iron, or other metal items not listed, even if attached to the structural framing.

1.04 SYSTEM DESCRIPTION

A. General: Unless otherwise specifically approved in writing, furnish exact sections, weights, and kinds of material specified, using details and dimensions shown.
   1. Not all connections are detailed; similar details apply to similar conditions, unless otherwise indicated. Contact the ENGINEER promptly to verify design of members or connections in any situation where design requirements are unclear.

1.05 SUBMITTALS

A. Provide all submittals in accordance with section 01300.

B. Product Data: Producer's or manufacturer's information for products as follows, including sufficient data to show compliance with specified requirements:
   1. Mill test reports for each type of structural steel furnished.
   2. Test reports for high-strength bolts, nuts, and washers, including chemical analysis, tensile strength tests, and hardness tests.
   3. Test reports for direct tension indicators.
   4. Specifications for primer paint, including manufacturer's data on chemical composition, adhesion of spray fireproofing, and dry film thickness per applied coat.
   5. Specifications for non-shrink grout.

C. Shop Drawings: Complete drawings for structural steel, including information on location, type, and size of all connections, distinguishing between those made in the shop and those made in the field.
   1. Indicate weld lengths and sizes, using standard American Welding Society (AWS) welding symbols.
   2. Include setting drawings and templates for anchorages to be installed by others.
   3. Prepare shop drawings under the seal of a Professional Structural Engineer registered in the state of Florida.
   4. The fabricator is specifically responsible for the adequacy of any connections designed by the fabricator to performance standards established in the contract documents. Approval by the ENGINEER of shop drawings shall not relieve the fabricator of this responsibility, despite wording to the contrary in paragraph 4.2.1 of the AISC Code.

D. Test Reports: Submit test reports for all specified tests of connections.

E. Welder Qualifications: Evidence that welders employed in the work are currently certified under American Welding Society (AWS) qualification procedures.

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F. Surveys: Certified copies of specified surveys, showing locations of all critical elements and deviations from data shown on Contract documents.

1.06 QUALITY ASSURANCE

A. Welding Procedures: Establish that joint welding procedures are prequalified or test in accordance with American Welding Society (AWS) qualification procedures.

B. Regulatory Requirements: Unless other requirements of governing authorities or particular requirements of this specification are more stringent, comply with provisions of the following:
   1. AISC "Code of Standard Practice for Steel Buildings and Bridges."
   2. AISC "Specification for Structural Steel Buildings -- Allowable Stress Design and Plastic Design," with Commentary and Supplements.
   3. AWS D1.1, "Structural Welding Code - Steel."

C. Testing and Inspection Agency: Engage an independent testing and inspection agency acceptable to the OWNER to perform testing, inspect and evaluate connections, and prepare test reports.
   1. Correct deficiencies in the structural steel work identified by the testing and inspection agency at no additional expense to the OWNER. Subsequent tests to confirm the adequacy of corrected work will be at the CONTRACTOR's expense.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Shipping: Deliver steel in timely fashion, to permit the most efficient and economical flow of work. Deliver steel members properly marked for field assembly and erection.
   1. Deliver anchor bolts, washers, and other anchorage devices to be built into other work in time to avoid delays and permit their proper installation.

B. Storage: Protect steel and other materials of this section from damage and corrosion. If temporary storage at the project site is required, keep steel members off the ground, using platforms or pallets, in location easily accessible for inspection.

PART 2- PRODUCTS

2.01 STEEL MATERIALS

A. AESS Materials - General: For members which will be exposed in the finished work and have been identified as AESS on the drawings, provide only materials which are free of surface blemishes such as pitting, roller marks, rolled trade names, and surface roughness.

B. Structural Steel Members (refer to plans for locations indicated):
   1. Wide flanges and WT sections: ASTM A992, Fy=50 ksi
   2. Channels, angles, plates, and miscellaneous steel: ASTM A36, Fy=36 ksi
   3. 316 Stainless Steel: ASTM A484, ASTM A276, Fy=30 ksi
   4. Structural Tubing, Cold-Formed: ASTM A500, Fy=46 ksi

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5. Steel Pipe: ASTM A53, Type E or S, Grade B, Fy=35 ksi

C. Anchor Bolts: ASTM F1554, Carbon steel, Grade 36; ASTM A 36 steel plate washers.

D. Bolts and Nuts:
1. Carbon Steel: ASTM A307, Grade A
2. High Strength Steel: ASTM A325, Type 1, plain (medium carbon steel)
3. Stainless Steel: ASTM F593, ASTM F594
4. AESS: Provide hexagonal bolt heads and nuts at all exposed connections.

E. Hardened Washers: ASTM F436, ASTM A240 (for stainless)
1. Dimensional requirements shall meet ANSI B18.22.1, Type A plain.

F. Direct Tension Indicators: At CONTRACTOR's option, provide either load indicator washers complying with ASTM F 959 or snapoff highstrength bolts certified to provide the minimum fastener tension in accordance with AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts" at all connections requiring highstrength bolts.

G. Shear Connectors: ASTM A108, Grades 1010 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B. Minimum Yield Strength = 50 ksi. Test Shear connectors in accordance with AWS. All studs shall be a minimum ¾ inch diameter unless otherwise noted.

2.02 MISCELLANEOUS MATERIALS

A. Welding Electrodes and Fluxes: AWS D1.1, Types as follows:
1. E70XX.

B. Nonshrink Grout: Prepackaged material requiring only the addition of water and complying with ASTM C 1107, and as follows:
1. Natural aggregate (nonmetallic) type.
2. Products: The following products, provided they comply with requirements of the contract documents, will be among those considered acceptable:
a. "Masterflow 928"; Master Builders, Inc.
b. "Sonogrout 14k"; Sonneborn Building Products Division/ChemRex, Inc.
c. "Euco N-S Grout"; The Euclid Chemical Company.
d. "Supreme"; Cormix Construction Chemicals.
e. "Five Star Grout"; Five Star Products, Inc.

C. Shop Primer: Fabricator's standard primer.

2.03 FABRICATION

A. Shop Assembly - General: Comply with requirements of AISC Specifications. Shop fabricate and assemble to maximum degree possible.
1. AESS: Comply with requirements of AISC Code for architecturally exposed structural steel.
a. Appearance: Cut, fit, and assemble units with exposed surfaces smooth, square, and free from cutting marks, shear distortion, burrs, and nicks.

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b. Tolerances: As specified in AISC Code for AESS, unless more stringent requirements are indicated on the drawings.

B. Thermal Cutting: Perform all thermal cutting by machine.
1. Plane thermally cut edges which are to be welded.

C. Connections:
1. Shop connections: As indicated on the drawings.
2. Field connections: As indicated on the drawings.
3. Bolts: High-strength steel bolts, except as otherwise indicated.
a. Bolting: Comply with requirements of AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
4. Welds: Comply with requirements of AWS Code for welding procedures and quality of welds, including appearance.
a. Built-up sections: Assemble components and weld using procedures which will maintain proper alignment of finished section.
b. AESS: Verify that weld sizes, fabrication sequence, and equipment to be employed will limit distortions to allowable tolerances. Surface bleed of back-side welding on exposed surfaces will not be acceptable.
1) Grind smooth exposed fillet welds 1/2 inch and larger.
2) Grind flush butt welds.
3) Dress all exposed welds.

D. Finishing: Accurately mill ends of columns and other members which must transmit loads in bearing.

E. Holes in Steel Members: Make all holes by means of cutting, drilling, or punching at right angles to surface of metal. Do not make or enlarge holes by burning.
1. Provide holes in steel members as required to permit connection of work by others.

2.04 SHOP COATING – GALVANIZING

A. Galvanize the following items:
1. All structural steel exposed to weather and as indicated on drawings to a G90 coating criteria.

B. Preparation: Thoroughly clean members to be galvanized, removing loose rust and mill scale.

C. Galvanizing: Perform galvanizing after fabrication in accordance with requirements of ASTM A 123, except galvanize all fastener assemblies in accordance with ASTM A153, use galvanizing methods which provide surface suitable for painting with min class A slip coefficient (0.33).

2.05 SHOP COATING – PAINT

A. Shop prime all steel members, except:
1. Galvanized steel members.
2. Steel members embedded in concrete or mortar.
3. Do not paint the following surfaces:

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a. Machined or milled surfaces.
b. Surfaces adjacent to field welds.
c. Faying surfaces of bolted connections.
d. Portions of member that receive a special coating. Refer to Section 09900.

B. Preparation: Thoroughly clean steel surfaces to be shop primed, removing loose rust, loose mill scale, dirt, oil, and grease. Clean steel in accordance with SSPC procedures as follows:
1. Power tool or blast cleaning: SSPC SP-3, -5, -6, or -10.

C. Painting: As soon as possible after cleaning, apply specified primer paint in accordance with instructions of paint manufacturer, at a rate sufficient to provide a finished thickness of not less than 1.5 mils and an average thickness of 2.0 mils.

2.06 SHOP QUALITY CONTROL

A. Testing and Inspection:
1. General: Provide access to testing and inspection agency so that specified testing and inspection can be safely accomplished.
2. Shop bolted connections: Comply with testing and verification procedures in AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts," except test not less than the following number of bolts in each bolted connection: All slip critical connections as noted SC on drawings.
3. Shop welded connections: Inspect and test shop-fabricated welds as follows:
a. Visually inspect all welds.
b. Inspect 100. percent of full penetration welds, using test method as follows:
1) Radiographic testing (ASTM E 94 and ASTM E 142).
c. Inspect 20 percent of fillet welds, using one of the following test methods:
1) Radiographic Testing (ASTM E 94 and ASTM E 142).
2) Magnetic Particle Inspection (ASTM E 709).
3) Ultrasonic Testing (ASTM E 164).
4) Liquid Penetrant Inspection (ASTM E 165).

PART 3- EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine areas and conditions for erection of structural steel and verify that the work may properly proceed. Do not commence erection of structural steel until unsatisfactory conditions have been corrected or fabricated steel components have been adjusted with the architect's agreement.
1. Surveys: Conduct verification surveys by a Professional Engineer or Land Surveyor registered in the state of Florida.

3.02 PREPARATION

A. Temporary Support: Provide temporary guys, braces, falsework, cribbing, or other elements required to secure the steel framing against loads equal in intensity to

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design loads. Remove such temporary support only when permanent connections have been made and the steel framing is fully capable of supporting design loads, including any temporary construction loads.

3.03 ERECTION

A. General: Erect structural steel in compliance with AISC Code of Standard Practice and Specifications.
   1. AESS: Comply with erection requirements of AISC Code dealing with architecturally exposed structural steel.

B. Assembly:
   1. Set structural members accurately to locations and elevations indicated, within tolerances established in AISC Code, before making final connections.
   2. Do not use thermal cutting to correct fabrication errors on any major structural member.
      a. Thermal cutting of secondary members may be permitted by the Engineer upon request, but only when members involved are not loaded.

C. Columns and Bearing Surfaces:
   1. Clean bearing and contact surfaces before assembly. Slightly roughen concrete and masonry surfaces to improve bond.
   2. Set base and bearing plates accurately, using metal wedges, shims, or setting nuts as required.
   3. After tightening anchor bolts and ensuring that structure is plumb, grout solidly between plates and bearing surfaces.
      a. Comply with manufacturer's instructions for nonshrink grout.

D. Bolting:
   1. Carbon steel bolts: Use only for temporary bracing during erection, unless otherwise specifically permitted by contract documents.
   2. High-strength bolts: Comply with requirements of AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts."

E. Welding:
   1. Do not perform field welding when ambient temperature is at 0 degrees F or below, or when surfaces are wet, exposed to rain, snow, or high wind.
   2. Perform field welding in accordance with AWS "Structural Welding Code - Steel."
   3. Tighten and leave in place erection bolts used in field-welded construction.
      a. AESS: Verify that weld sizes, erection sequence, and equipment to be employed will limit distortions to allowable tolerances. Surface bleed of back-side welding on exposed surfaces is not acceptable.
         1) Grind smooth exposed fillet welds 1/2 inch and larger.
         2) Grind flush butt welds.
         3) Dress all exposed welds.
         4) Remove erection bolts, plug-weld bolt holes, and grind smooth.

F. Touch-up Painting: As soon as possible after erection of primed structural steel, clean painted areas which have been abraded or otherwise damaged by welding, bolting, or other field operations. Apply touch-up paint matching shop coating by

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brush or spray to all damaged paint areas, achieving a minimum final thickness of 1.5 mils.

3.04 FIELD QUALITY CONTROL

A. Testing and Inspection:
   1. General: Provide access to testing and inspection agency so that specified testing and inspection can be safely accomplished.
   2. Field-bolted connections: Comply with testing and verification procedures in AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts," except test not less than the following number of bolts in each bolted connection: All slip critical connections as noted SC on the drawings.
   3. Field-welded connections: Inspect and test field-fabricated welds as follows:
      a. Visually inspect all field welds.

END OF SECTION 05120

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SECTION 05400

COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.01 SUMMARY

A. Description of scope and intent:
   1. CONTRACTOR shall provide all material, labor, and tools required to complete the installation of specified system.
   2. Any omissions of reference to items required to complete the full operational and functional system specified in the section does not relieve the CONTRACTOR of the obligation to provide same.
   3. To provide installation of all items, including delivery, dispersing to the proper locations within the building, and affixing in place.
   4. Installation shall be accomplished by workers skilled in their craft that will perform their work in a professional manner and will leave the premises safe, orderly and clean.
   5. Drawings and general provisions of Contract, including EJCDC General and Supplementary Conditions and Division 1 Specifications Sections, apply to this section.
   6. CONTRACTOR is responsible for coordination of work included in this specification with all other specification sections related to furnishing of all materials, labor, permits, fees and services necessary for completion of Work in this section.

B. Section Includes:
   1. Exterior wall framing.
   2. Interior load-bearing wall framing.
   3. Roof rafter framing.
   4. Roof equipment support framing.

C. Related Sections include the following:
   1. Division 5 Section "Metal Fabrications" for masonry shelf angles and connections.
   2. Division 6 Section "Rough Carpentry" for sub-flooring, wall sheathing, or roof sheathing using wood-based structural-use panels, particleboard, fibrous-felted board, and foam-plastic sheathing.
   3. Division 9 Section "Gypsum Board Assemblies" for interior non-load-bearing metal-stud framing and ceiling-suspension assemblies.
   4. Division 9 Section "Gypsum Board Shaft-Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.

1.02 DEFINITIONS

A. Minimum Uncoated Steel Thickness: Minimum uncoated thickness of cold-formed framing delivered to the Project site shall be not less than 95 percent of the thickness used in the cold-formed framing design. Lesser thickness shall be permitted at bends due to cold forming.

B. Producer: Entity that produces steel sheet coil fabricated into cold-formed members.

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1.03 REFERENCES

Comply with the following documents, except where requirements of the Contract Documents or of governing codes and governing authorities are more stringent. All referenced standards refer to the edition in force at the time these Drawings and Specifications are issued.

A. ASTM A 90 -- Standard Test Method for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.

B. ASTM A 446-- Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality

C. ASTM A 570-- Standard Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality.

D. ASTM A 611-- Standard Specification for Steel, Sheet, Carbon, Cold-Rolled, Structural Quality.

E. ASTM C 1007-- Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.

F. ASTM A 653—Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

1.04 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. Shop Drawings: Show layout, spacing, sizes, thickness, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining Work.

C. Mill certificates signed by steel sheet producer indicating steel sheet complies with requirements.

D. Welding Certificates: Copies of certificates for welding procedures and personnel.

E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and OWNERs, and other information specified.

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F. Product Test Reports: From a qualified testing agency indicating that each of the following complies with requirements, based on comprehensive testing of current products:
   1. Mechanical fasteners.
   2. Miscellaneous structural clips and accessories.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer with minimum of five (5) years experience and who has completed cold-formed metal framing similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Mill certificates signed by steel sheet producer indicating steel sheet complies with requirements, including uncoated steel thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and galvanized-coating thickness.

C. Testing Agency Qualifications: Employ, at CONTRACTOR’s expense, an independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

D. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

E. Fire-Test-Response Characteristics: Refer to Architectural specifications for all fire ratings.

F. AISI Specifications: Comply with AISI's "Specification for the Design of Cold-Formed Steel Structural Members" for calculating structural characteristics of cold-formed metal framing**:**
   1. CCFSS Technical Bulletin: "AISI Specification Provisions for Screw Connections."

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling. Follow all MANUFACTURER’s written instruction unless otherwise noted herein.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation. Follow all MANUFACTURER’s written instruction unless otherwise noted herein.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

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A. Available MANUFACTURERs: Subject to compliance with requirements, MANUFACTURERs offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:
   1. Dietrich Industries, Inc.

2.02 MATERIALS

A. Steel Sheet: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
   1. Grade: As indicated on drawings.
   2. Coating: G60.

2.03 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories of the same material and finish used for framing members, with a minimum yield strength of 45,000 psi.

B. Provide accessories of MANUFACTURER's standard thickness and configuration, unless otherwise indicated, as follows:
   1. Supplementary framing.
   2. Bracing, bridging, and solid blocking.
   3. Web stiffeners.
   4. End clips.

2.04 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36, zinc coated by hot-dip process according to ASTM A 123.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. Mechanical Fasteners: Corrosion-resistant-coated, self-drilling, self-threading steel drill screws as indicated on drawings.

D. Welding Electrodes: Comply with AWS standards.

2.05 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, ASTM A 780.

2.06 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to MANUFACTURER's written recommendations and requirements in this Section.
   1. Fabricate framing assemblies using jigs or templates.
   2. Cut framing members by sawing or shearing; do not torch cut.

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3. Fasten cold-formed metal framing members as indicated on the drawings. Wire tying of framing members is not permitted.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Grout bearing surfaces uniform and level to ensure full contact of bearing flanges or track webs on supporting concrete.

3.02 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to ASTM C 1007, unless more stringent requirements are indicated.

C. Install cold-formed framing and securely anchor to supporting structure.
1. Bolt wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to MANUFACTURER's written recommendations and requirements in this Section.
1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members by screw fastening, as standard with fabricator and indicated on drawings. Wire tying of framing members is not permitted.

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E. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.

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F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Install insulation in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work. Refer to architectural for insulation requirements

I. Fasten hole-reinforcing plate over web penetrations that exceed size of MANUFACTURER's standard punched openings.

J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
   1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.03 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and MANUFACTURER's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to MANUFACTURER and Installer, that ensure cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05400

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SECTION 05500

METAL FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Description of scope and intent:
   1. CONTRACTOR shall provide all material, labor, and tools required to complete the installation of specified system.
   2. Any omission of reference to items required to complete the full operational and functional system specified in the section does not relieve the CONTRACTOR of the obligation to provide same.
   3. To provide installation of all items, including delivery, dispersing to the proper locations within the building, and affixing in place.
   4. Installation shall be accomplished by workers skilled in their craft that will perform their work in a professional manner and will leave the premises safe, orderly and clean.
   5. Drawings and general provisions of the DBIA Agreement Documents, including Division 1 Specification Sections, apply to this Section.
   6. CONTRACTOR is responsible for coordination of work included in this specification with all other specification sections related to furnishing of all materials, labor, permits, fees and services necessary for completion of work in this section.
   7. In the event of a conflict between the design drawings, referenced standards and these Specifications, the more stringent shall govern unless directed otherwise by the ENGINEER. CONTRACTOR shall strictly adhere to OSHA requirements and local codes or those of any regulatory agency or body with jurisdiction.

B. This Section includes the following:
   1. Steel framing and supports for applications where framing and supports are not specified in other specification sections or on the structural drawings.

1.02 SUBMITTALS

A. Provide all submittals in accordance with Section 01300.

B. Shop Drawings: Detail fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
   1. Provide templates for anchors and bolts specified for installation under other Sections.

C. Welding Certificates: Copies of certificates for welding procedures and personnel.

1.03 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

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B. Welding: Qualify procedures and personnel according to the following:
   1. AWS D1.1, "Structural Welding Code--Steel."
   2. AWS D1.3, "Structural Welding Code--Sheet Steel."
   3. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.04 PROJECT CONDITIONS

A. Field Measurements: Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting.

1.05 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.01 METALS, GENERAL

A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

2.02 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Malleable-Iron Castings: ASTM A 47, Grade 32510.

C. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.03 PAINT

A. Shop Primer for Ferrous Metal: Fast-curing, lead and chromate free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with

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finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

B. Galvanizing Repair Paint: High-zinc-dust-content paint for re-galvanizing welds in steel, complying with SSPC-Paint 20.

C. Paint coats: Refer to specification 09900.

2.04 FASTENERS

A. General: Provide Type 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for type, grade, and class required.

B. Anchor Bolts: ASTM F 1554, Grade 36.

C. Machine Screws: ASME B18.6.3.

D. Lag Bolts: ASME B18.2.1.

E. Wood Screws: Flat head, carbon steel, ASME B18.6.1.

F. Plain Washers: Round, carbon steel, ASME B18.22.1.

G. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1.

H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
   1. Material: Galvanized expansion or stainless steel anchors.

I. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as needed.

2.05 GROUT

A. Nonshrink, Metallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy-duty loading applications.

2.06 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Shear and punch metals cleanly and accurately. Remove burrs.

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C. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

E. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

F. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

G. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

H. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

I. Remove sharp or rough areas on exposed traffic surfaces.

J. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

2.07 STEEL ANGLES

A. Fabricate angles from steel angles of sizes required or indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete. Align expansion joints in angles with indicated control and expansion joints.

C. Galvanize steel angles to be installed in all walls. All exposed exterior angles shall also be painted.

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2.08 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports that are not a part of structural-steel framework as necessary to complete the Work.

B. Fabricate units from structural-steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
   1. Fabricate units from slotted channel framing where indicated.

C. Galvanize all miscellaneous framing and supports.

2.09 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.10 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
   1. ASTM A 123, for galvanizing steel and iron products.
   2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:
   1. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors.

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B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

E. Field Welding: Comply with the following requirements:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

G. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
   1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
   2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.02 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings, if any.

3.03 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

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B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Specification 09900.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05500

SECTION 07265

UNDERSLAB VAPOR PROTECTION

PART 1 — GENERAL

1.01 SUMMARY

A. Description of Scope and Intent:
   1. CONTRACTOR shall provide all material, labor, and tools required to complete the installation of specified system.
   2. Any omission of reference to items required to complete the full operational and functional system specified in the section does not relieve the CONTRACTOR of the obligation to provide same.
   3. To provide installation of all items, including delivery, dispersing to the proper locations within the building, and affixing in place.
   4. Installation shall be accomplished by workers skilled in their craft that will perform their work in a professional manner and will leave the premises safe, orderly and clean.
   5. Drawings and general provisions of Contract, including EJCDC General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
   6. CONTRACTOR is responsible for coordination of work included in this specification with all other Specification sections related to furnishing of all materials, labor, permits, fees and services necessary for completion of work in this section.
   7. In the event of a conflict between the design Drawings, referenced standards and these Specifications, the more stringent shall govern unless directed otherwise by the ENGINEER. CONTRACTOR shall strictly adhere to OSHA requirements and local codes or those of any regulatory agency or body with jurisdiction.

B. This Section includes integral pre-applied waterproofing membrane and vapor barrier that bonds to poured concrete for use below slabs on grade, installed in direct contact with concrete.

1.02 SUBMITTALS

A. Submit MANUFACTURER’s product data, installation instructions and membrane samples for approval in accordance with Section 01300.

1.03 REFERENCE STANDARDS

A. The following standards and publications are applicable to the extent referenced in the text.

B. American Society for Testing and Materials (ASTM):
   1. D 412– Standard Test Methods for Rubber Properties in Tension
   2. D 903– Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
   3. D 3767– Standard Practice for Rubber - Measurements of Dimensions

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4. E 96– Standard Test Methods for Water Vapor Transmission of Materials
5. E 154– Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover
6. E 1643– Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs
7. E 1745– Plastic Vapor Retarders Used in Contact with Soil or Granular fill under Concrete Slabs

C. American Concrete Institute (ACI) ACI 302.1R-96 Addendum Vapor Retarder Location: For slabs with vapor-sensitive floor coverings, locate retarder in direct contact with the slab (not beneath a layer of granular fill).

1.04 QUALITY ASSURANCE

A. Materials: For each type of material required for the work of this section, provide primary materials that are the products of one manufacturer.

B. Schedule Coordination: Schedule work such that membrane will not be left exposed to weather for longer than that recommended by the manufacturer.

1.05 DELIVERY, STORAGE AND HANDLING

A. Refer to Section 01600. Deliver materials in labeled packages. Store and handle in strict compliance with manufacturer's instructions. Protect from damage from weather, excessive temperature and construction operations. Remove and dispose of damaged material in accordance with applicable regulations.

PART 2 — PRODUCTS

2.01 MATERIALS

A. Basis of Design - Integrally Bonded Vapor Protection: Florprufe™ 120 Membrane by Grace Construction Products, or an equivalent underslab vapor barrier capable of integrally bonding to concrete. The vapor barrier shall be a 0.5 mm (0.021 in) nominal thickness composite sheet membrane comprising 0.4 mm (0.016 in.) of polyolefin film, and layers of specially formulated synthetic adhesive layers. The membrane shall form an integral and permanent bond to poured concrete to prevent vapor migration at the interface of the membrane and structural concrete.

B. Provide membrane with the following physical properties:

Property	Typical Value	Test Method
Thickness (nominal)	0.5 mm (0.021 in)	ASTM D3767 Method A
Water Vapor Permeance	0.03 perms	ASTM E96 Method B *
Tensile Strength	68 lb./in	ASTM E154 *
Elongation	300%	ASTM D412
Puncture Resistance	3300 grams	ASTM D1709 *
Peel Adhesion to Concrete	>4 lb./in	ASTM D903

* ASTM E 1745 Requirements.

PART 3 — EXECUTION

3.01 EXECUTION

A. The installer shall examine conditions of substrates and other conditions under which this work is to be performed and notify the CONTRACTOR, in writing, of circumstances detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Earth and stone substrates shall be well compacted to produce an even, solid substrate. Remove loose aggregate or sharp protrusions. Concrete substrates shall be smooth or broom finished and monolithic. Remove standing water prior to membrane applications.

B. Place all foundation and slab insulation around slab/foundation perimeter before installation of membrane. Join the entire perimeter edges of the vapor barrier with the waterproof barrier sealing the foundation walls.

C. Installation shall be in accordance with manufacturer's instructions and ASTM E 1643–98, including but not limited to, the following:
   1. Apply membrane with the HDPE film facing the prepared substrate. Remove the release liner during application.
   2. Apply succeeding sheets by overlapping the previous sheet 50-mm (2-inch.) along the marked lap line. End Laps should be staggered to avoid a build up of layers.
      a. Mechanical Fastening – To prevent the membrane from moving and gaps opening, the laps should be fastened together at 39 in maximum centers. Fix through the center of the lap area using 0.5-inch long washer-head self-tapping galvanized screws.
      b. Taped Lap – Use manufacturer's recommended tape to secure and seal the overlaps. Overband the lap with 4-inch wide tape using the lap line for alignment. Remove plastic release liner to ensure bond to concrete.

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3. Mix and apply liquid detailing compound to seal around penetrations such as drainage pipes, etc.

3.03 CONCRETE PLACEMENT

A. Place concrete within 30 days. Inspect membrane and repair any damage with patches of tape. Ensure all liner is removed from membrane and tape before concrete placement.

3.04 SCHEDULE

A. Provide underslab vapor barrier under all building slabs on grade, including the Effluent PS and UV electrical building. Perimeter of underslab vapor barriers shall join the sealant of the foundation.

END OF SECTION 07265

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SECTION 07900

JOINT SEALERS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:
   1. The sealing of joints indicated on schedule at the end of this Section.
   2. The sealing of other joints indicated on Drawings.

B. Joints of a nature similar to that of joints indicated on the schedule shall be sealed with same sealer, whether indicated on Drawings to be sealed or not.

1.02 DEFINITIONS

A. Substrates:
   1. M-type substrates: Concrete, concrete masonry units, brick, mortar, natural stone. The term "masonry" means brick, stone, and concrete masonry work.
   2. G-type substrates: Glass and transparent plastic glazing sheets.
   3. A-type substrates: Metals, porcelain, glazed tile, and smooth plastics.
   4. O-type substrates: Wood, unglazed tile; substrates not included under other categories.

1.03 SUBMITTALS

A. Provide submittals in accordance with Section 01300 including: product data, samples for color selection: (products exposed to view only), certified product test reports and manufacturers certificates

1.04 PROJECT CONDITIONS

A. Environmental Limitations: Do not install sealers if any of the following conditions exist:
   1. Air or substrate temperature exceeds the range recommended by sealer manufacturers.
   2. Substrate is wet, damp, or covered with snow, ice, or frost.

B. Dimensional Limitations: Do not install sealers if joint dimensions are less than or greater than that recommended by sealer manufacturer; notify the ENGINEER and get sealer manufacturer's recommendations for alternative procedures.

1.05 WARRANTY

A. Submit written warranty signed by CONTRACTOR and installer guaranteeing to correct failures in sealer work that occur within 5 years after substantial completion, without reducing or otherwise limiting any other rights to correction which the OWNER may have under the Contract documents. Failure is defined as failure to remain weather tight due to faulty materials or workmanship. Correction is limited to replacement of sealers.

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PART 2 - PRODUCTS

2.01 MATERIALS - GENERAL

A. General: Provide only products which are recommended and approved by their MANUFACTURER for the specific use to which they are put and which comply with all requirements of the Contract documents.
   1. Provide only materials which are compatible with each other and with joint substrates.
   2. Colors of exposed sealers: As selected by the ENGINEER from MANUFACTURER's standard colors.

B. Manufacturers: Products of the manufacturers listed, provided they comply with requirements of the contract documents will be among those considered acceptable.
   1. Silicone sealants:
      a. Dow Corning Corporation
      b. Pecora Corporation
      c. Tremco, Inc
      d. GE Silicones
   2. Acrylic solvent-release sealants:
      a. Pecora Corporation
      b. Koch Protective Treatments, Inc.
      c. Tremco, Inc.
   3. Acrylic-latex emulsion sealant:
      a. Bostik Inc.
      b. Pecora Corporation
      c. Sonneborn Building Products Division/Chemrex, Inc.

2.02 ELASTOMERIC SEALANTS

A. Elastomeric Sealants - General: Chemically curing elastomeric sealants of types indicated, complying with ASTM C 920, including specific Type, Grade, Class, and Uses indicated, as well as all other requirements specified.
   1. Where movement capability exceeding that measured by ASTM C 920 is specified, sealant shall withstand the total movement indicated while remaining in compliance with the other requirements specified, when tested in accord with ASTM C 719, with base joint width measured at the time of application.
   2. For M-type substrates: Comply with requirements for Use M.
   3. For G-type substrates: Comply with requirements for Use G.
   4. For A-type substrates: Comply with requirements for Use A.
   5. For O-type substrates: Comply with requirements for Use M (minimum) and Use O for the particular substrate.

B. High Movement Silicone Sealant: One- or two-part non-acid-curing, Grade NS, Class 25, Use NT, plus movement capability of more than 50 percent in both extension and compression.

C. High Strength Silicone Sealant: One- part acid-curing or non-acid curing, Type S, Grade NS, Class 25, Use NT, with not over plus or minus 30 percent in movement capability.

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2.03 SOLVENT-RELEASE-CURING SEALANTS

A. Acrylic Sealant: Nonsag, one-part, solvent-release-curing; complying with ASTM C 920, Type S, Grade NS, use NT, with the following exceptions.
   1. Weight loss: 15 percent, maximum.
   2. Movement capability: 7.5 percent in both extension and compression, minimum.

2.04 LATEX SEALANTS

A. Acrylic-latex emulsion sealant: One-part, non-sag, mildew-resistant, paintable; complying with ASTM C 834.

2.05 NONCURING SEALERS

A. Butyl polyisobutylene sealant: Non-curing, nondrying, solvent-release; complying with 809.2, as described in AAMA 800.

2.06 SEALANT BACKERS

A. Backers - General: Non-staining; recommended or approved by sealant manufacturer for specific use.

2.07 URETHANE JOINT SEALANTS

A. Single-component, nonsag, moisture-cure, polyurethane joint sealant: ASTM C920, Type S, Grade NS, Class 50, Use NT; Greenguard certified.
   1. Volatile Organic Compound (VOC) Content: 40 g/L maximum.
   2. Volatile Organic Emissions (VOE): Not greater than Greenguard children and Schools certification emissions levels.
   3. Tensile Strength ASTM D412: 350 to 450 psi
   4. Percent Elongation ASTM D412: 800 to 900%
   5. Modulus at 100% ASTM D412: 75 to 85 psi
   6. Tear Strength ASTM D412: 65 to 75 psi
   7. Smoke Development ASTM E84: 5
   8. Color: As selected by ENGINEER from MANUFACTURER’s standard line of not less than 20 colors.

PART 3 - EXECUTION

3.01 PREPARATION

A. Do not begin joint sealer work until unsatisfactory conditions have been corrected.

B. Masking Tape: Use masking tape to keep primers and sealers off of adjacent surfaces which would be damaged by contact or by cleanup. Remove tape as soon as practical.

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3.02 INSTALLATION

A. Comply with sealer manufacturers' installation instructions and recommendations, except where more restrictive requirements are specified.

3.03 SCHEDULE OF JOINT SEALERS

A. Exterior joints for which no other sealer Is indicated:
   1. Use one of the following sealants:
      a. High movement silicone sealant.
   2. Backer: Backer rod.
   3. Joint shape: Concave joint configuration.

B. Interior joints for which no other sealer is indicated:
   1. Use one of the following sealants:
      a. Acrylic-emulsion latex sealant.
   2. Backer: Backer rod.
   3. Joint shape: Concave joint configuration.

C. Exterior joints well protected from weather and not subject to movement:
   1. Use one of the following sealants:
      a. Acrylic sealant.
   2. Backer: Backer rod.

D. Exterior movement joints (Control Joints) in concrete unit masonry:
   1. Use one of the following sealants:
      a. Urethane joint sealant.

E. Joints around pipes, ducts, and conduit penetrating exterior walls and roofs:
   1. Use one of the following sealants:
      a. Same as used for adjacent substrates.

F. All exterior flashing:
   1. Use one of the following sealants:
      a. High strength silicone sealant.

G. Butyl polyisobutylene sealant.
   1. Use bond-breaker tape.
   2. Joint shape: Concave joint configuration.

END OF SECTION 07900

SECTION 08100

FRP DOORS AND PANELS

PART 1 - GENERAL

1.01 SUMMARY

A. iberglass reinforced plastic (FRP) standard and custom doors.

B. Doors meeting this Specification shall be provided for all buildings on the architectural schedule.

1.02 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including SJCUD General Conditions and Division 1 Specification sections, apply to work in this section.

B. Related Sections include:
   1. Door Hardware - Section 08710

1.03 REFERENCES

A. Textured fiberglass reinforced plastic (FRP) standard and custom doors.
   1. ASTM-D256 – Standard Test Methods for Determining the Pendulum Impact Resistance of Plastics.
   2. ASTM-D570 – Standard Test Method for Water Absorption of Plastics.

1.04 SUBMITTALS

A. All submittals shall be in accordance with Section 01300.

B. Product Data: MANUFACTURER's printed product data indicating characteristics of products specified in this Section. Include details of core, stile and rails, hardware mounting, trim for lites, etc.

C. If required by the ENGINEER, furnish a corner sample of the doors showing core, joints, and fasteners, quality of workmanship, hardware reinforcements and accessory items.

D. Shop Drawings:
   1. Plans: Indicate location of each door opening assembly in project.
   2. Elevations: Dimensioned elevation of each type door opening assembly in project; indicate sizes and locations of door hardware, and lights and louvers, if specified.
   3. Details: Installation details of each type installation condition in project; indicate installation details of glazing, if specified.
   4. Schedule: Indicate each door opening assembly in project; cross-reference to plans.

E. Selection Samples: Manufacturer's standard color chips.

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F. Verification Samples: Two (2) samples to verify color match.

G. Manufacturer's Instructions: Printed installation instructions for door opening assemblies.

H. Warranty Documents: MANUFACTURER's warranty documents, executed by MANUFACTURER's representative, countersigned by CONTRACTOR.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 01600 for additional details.

B. Packing, Shipping, Handling, and Unloading: Package door opening assemblies in manufacturer's standard containers or protective wrap.

C. Store door assemblies in manufacturer's standard containers, on end, to prevent damage to face corners and edges.

1.06 WARRANTY

A. Manufacturer's Warranty: Warrant doors against failure due to defective materials or workmanship for a period of ten (10) years from date of substantial completion of project. Warranty to be written on MANUFACTURER's letterhead and shall provide for the replacement of doors if they should fail within the warranty period. Warranty shall not cover damage due to vandalism, faulty installation, or lack of maintenance.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Basis of design is FRP Special-Lite Door model SL-17, by Special-Lite, Inc. Decatur, Michigan; Telephone 1-800-821-6531. Other manufacturers, subject to compliance with the Specifications and project requirements, may submit as follows:
   1. FIB-R-DOR Division of Advance Fiberglass, Inc.; P.O. Box 13268, Maumelle AR 72113; Telephone 1-800-342-7367, FAX 501-758-9496.
   2. Chem-Pruf Door Co., Ltd, P.O. Box 4560, Brownsville, TX 78523, Telephone 1-800-444-6924, FAX 956-544-7943.
   3. Tiger Door LLC Omaha, NE. 68102; Telephone 1-888-891-4416; www.tigerdoor.com.

2.02 MATERIALS

A. Fiberglass Mat: Minimum 1.5 ounces per square foot. Fiberglass Reinforced Polymer Face Material: 0.120 inch minimum thickness, with color integral through full thickness of face sheet. Provide pebble-like embossed finish for flush doors.

B. Resins: MANUFACTURER's formulation for fabricating units to meet specified

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requirements.

C. Anchors: MANUFACTURER's standard stainless steel expansion anchors for existing openings, and stainless steel masonry tee anchors for new construction.

D. Fasteners: Stainless steel.

2.03 MANUFACTURED UNITS

A. Non-rated Fiberglass Reinforced Plastic (FRP) Doors:
   1. Thickness: 1-3/4 inches.
   2. Minimum thermal Insulating Value: >R factor = 11. (.09 "U" value).
   3. Construction:
      a. Core: End-grain balsa wood, resin-impregnated.
         Or, closed cell polyurethane rigid foam, 5 pcf density (Special-Lite doors).
         Or, phenolic resin impregnated kraft paper honeycomb core (Tiger doors).
      b. Door Plates: Molded in one continuous piece, resin reinforced with hand-laid glass fiber mat, nominal 1/8-inch thick, minimum 15 mil pebble coated surface.
      c. Door Edges: Minimum three (3) layers resin-reinforced glass fiber mat, nominal 3/8-inch thick, machine tooled. Or, extruded aluminum with concealed tie-rod joinery (Special-Lite doors). Or, FRP edge strips chemically bonded to pultruded FRP subframe (Tiger doors).
   4. Sizes: As indicated on drawings.
   5. Finish: Light pebble grain texture (Special-Lite doors, etc.)
   6. Color: As approved by OWNER from manufacturer's full range of standard selections.

B. Door Hardware: Specified Section 08710.

2.04 FABRICATION

A. Fiberglass Reinforced Plastic (FRP) Doors:
   1. Minimum glass fiber to resin ratio: 30 percent.
   2. Mortise for lockset, and recess for strike plate in lock stile.
   3. Embed steel reinforcement for hinges in fiberglass matrix; provide for hinge leaf recesses in hinge stile. Or, provide pultruded tubular FRP and/or high density polymer compression blocks at all hardware locations (Tiger doors). Special-Lite doors may utilize their own proprietary hinge and reinforcement arrangement/method.

B. Fiberglass Frames:
   1. Mortise for lock strike, and recess for strike plate in lock jamb.
   2. Reinforce for hinges and other indicted hardware.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:
   1. Openings are correctly prepared to receive doors and frames.
   2. Openings are correct size and depth in accordance with shop drawings.

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B. Installer's Examination:
   1. Have installer examine conditions under which construction activities of this section are to be performed and submit written report if conditions are unacceptable.
   2. Transmit two copies of installer's report to ENGNEER within 24 hours of receipt.
   3. Beginning construction activities of this section before unacceptable conditions have been corrected is prohibited.
   4. Beginning construction activities of this section indicates installer's acceptance of conditions.

3.02 INSTALLATION

A. Install door opening assemblies in accordance with shop drawings, SDI-100, and MANUFACTURER's printed installation instructions, using installation methods and materials specified in installation instructions.

B. Installation of door hardware is specified in Section 08710.

C. Install door hardware in accordance with MANUFACTURER's printed instructions, using through-bolts to secure surface applied hardware.

D. Site Tolerances: Maintain plumb and level tolerances specified in MANUFACTURER's printed installation instructions.

3.03 ADJUSTING

A. Adjust doors in accordance with door manufacturer's maintenance instructions to swing open and shut without binding, and to remain in place at any angle without being moved by gravitational influence.

B. Adjust door hardware to operate correctly in accordance with hardware manufacturer's maintenance instructions.

3.04 CLEANING

A. Clean surfaces of door opening assemblies and sight-exposed door hardware in accordance with MANUFACTURER's maintenance instructions.

3.05 PROTECTION OF INSTALLED PRODUCTS

A. Protect door opening assemblies and door hardware from damage by subsequent construction activities until final inspection.

END OF SECTION 08100

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SECTION 08710

DOOR HARDWARE

PART 1 – GENERAL

1.01 SUMMARY

A. General Requirements
   1. The hardware schedule is provided as a basis of design only. The OWNER has requested the use of their typical hardware system. Provide and install the following Manufacturer's hardware items as follows:
      a. ANSI A156.1 Compliant full mortise type hinges.
      b. ANSI A5111 (Stainless steel). For use on heavy weight doors and doors requiring high frequency service.
      c. ANSI A5112 (Stainless steel). For use on medium weight doors and doors requiring medium frequency service.
      d. ANSI A5133 (Stainless steel). For use on medium weight doors or door requiring low frequency service.
      e. US32D Satin finished
      f. Stainless steel fasteners
   2. Lockset
      a. Mortise: Corbin Russwin, ML2000 Series-Heavy duty
      b. Cylindrical: Corbin Russwin, CL3300 Series-Extra heavy duty
   3. Handle and Trim
      a. Mortise: Lustra Lever Design Handle (LWA) for mortise lockset
         1) Satin Stainless Steel US32D (BHMA 630) finish
      b. Cylindrical: Newport lever handle (NZD)
         1) Satin chrome plated (626) finish
   4. Core
      a. Satin plated chromium (626), Complete Large Format Interchangeable Core (LFIC), 6-Pin high security, keyed to existing Corbin Russwin 60-70 series restricted system with construction control key.
   5. Key
      a. Patented Corbin Russwin Master Keying System

B. Section Includes: Finish Hardware for door openings, except as otherwise specified herein.
   1. Door hardware for fiberglass reinforced polymer (FRP) doors.
   2. Door hardware for other doors indicated.
   3. Keyed cylinders as indicated.

C. Related Sections:
   1. Division 8: FRP Doors and Frames

D. References: Comply with applicable requirements of the following standards. Where these standards conflict with other specific requirements, the most restrictive shall govern.
   1. Builders Hardware Manufacturing Association (BHMA)

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2. NFPA 101 Life Safety Code
A. NFPA 80 -- Fire Doors and Windows
3. ANSI-A156 - Various Performance Standards for Finish Hardware
4. UL10C – Positive Pressure Fire Test of Door Assemblies
5. ANSI-A117.1 – Accessible and Usable Buildings and Facilities 2009
6. DHI /ANSI A115.IG – Installation Guide for Doors and Hardware
7. Florida Building Codes for Hurricane (NOA) for exterior openings.

E. Intent of Hardware Groups
1. Should items of hardware not definitely specified be required for completion of the Work, furnish such items of type and quality comparable to adjacent hardware and appropriate for service required.
2. Where items of hardware aren't definitely or correctly specified, and are required for completion of the Work, a written statement of such omission, error, or other discrepancy to be submitted to ENGINEER, prior to date specified for the Guaranteed Maximum Price (GMP) for clarification by addendum; or, furnish such items in the type and quality established by this specification, and appropriate to the service intended.

1.02 SUBMITTALS

A. Comply with Section 01300.

B. Special Submittal Requirements: Combine submittals of this Section with Sections listed below to ensure the "design intent" of the system/assembly is understood and can be reviewed together.

C. Product Data: Manufacturer's specifications and technical data including the following:
1. Detailed specification of construction and fabrication.
2. Manufacturer's installation instructions.
3. Submit 6 copies of catalog cuts with hardware schedule.
4. Provide 9001-Quality Management and 14001-Environmental Management for products listed in Materials Section 2.02.

D. Shop Drawings - Hardware Schedule:
1. List groups and suffixes in proper sequence.
2. Completely describe door and list architectural door number.
3. Manufacturer, product name, and catalog number.
4. Function, type, and style.
5. Size and finish of each item.
6. Mounting heights.
7. Explanation of abbreviations and symbols used within schedule.

E. Templates: Submit templates and "reviewed Hardware Schedule" to door and frame supplier and others as applicable to enable proper and accurate sizing and locations of cutouts and reinforcing.

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F. Contract Closeout Submittals: Comply with Division 1 including specific requirements indicated.
   1. Operating and maintenance manuals: In accordance with Section 01730.
      a. Complete information in care, maintenance, and adjustment, and data on repair and replacement parts, and information on preservation of finishes.
      b. Catalog pages for each product.
      c. Name, address, and phone number of local representative for each manufacturer.
      d. Parts list for each product.
   2. Copy of final hardware schedule, edited to reflect, "As installed".
   3. Copy of final keying schedule.
   4. One set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

1.03 QUALITY ASSURANCE

A. General Requirements.
   1. Exterior Openings Severe Windstorm Components testing: Listed and labeled by a testing and inspecting agency acceptable to authority having jurisdiction, based on testing according to ANSI A250.13. Further compliance with Florida Building Codes for Hurricane (NOA) for Exterior Openings.
   2. Statement of qualification for distributor and installers.
   3. Statement of compliance with regulatory requirements and single source responsibility.
   4. Distributor's Qualifications: Firm with 3 years of experience in the distribution of commercial hardware.
      a. Distributor to employ full time Architectural Hardware Consultants (AHC) for the purpose of scheduling and coordinating hardware and establishing keying schedule.
      b. Hardware Schedule shall be prepared and signed by an AHC.
   5. Installer's Qualifications: Firm with 3 years of experience in installation of similar hardware to that required for this Project, including specific requirements indicated.
   6. Regulatory Label Requirements: Provide testing agency label or stamp on hardware for labeled openings
      a. Provide UL listed hardware for labeled and 20 minute openings in conformance with requirements for class of opening scheduled.
      b. Underwriters Laboratories requirements have precedence over this specification where conflict exists.
   7. Single Source Responsibility: Except where specified in hardware schedule, furnish products of only one manufacturer for each type of hardware.

B. Review project for extent of finish hardware required to complete the Work. Where there is a conflict between these Specifications and the existing hardware, notify the ENGINEER in writing and furnish hardware in compliance with the Specification unless otherwise directed in writing by the ENGINEER.

1.04 DELIVERY, STORAGE, AND HANDLING

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A. Packing and Shipping: Comply with Section 01600.
   1. Deliver products in original unopened packaging with legible manufacturer's identification.
   2. Package hardware to prevent damage during transit and storage.
   3. Mark hardware to correspond with "reviewed hardware schedule".
   4. Deliver hardware to door and frame manufacturer upon request.

B. Storage and Protection: Comply with manufacturer's recommendations.

1.05 PROJECT CONDITIONS

A. Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for the proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents.

B. Review shop drawings for doors and entrances to confirm that adequate provisions will be made for the proper installation of hardware.

1.06 WARRANTY

A. Manufacturer’s warranty shall be the following from substantial completion:
   1. Closers: Ten years
   2. Exit Devices: Three Years
   3. Locksets and Cylinders: Three years
   4. All other Hardware: Two years.

1.07 OWNER’S INSTRUCTION

A. Instruct OWNER’s personnel in operation and maintenance of hardware units.

B. Provide O&M manuals as per Section 01730.

1.08 MAINTENANCE

A. Extra Service Materials: Deliver to OWNER extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels.
   1. Special Tools: Provide special wrenches and tools applicable to each different or special hardware component.
   2. Maintenance Tools: Provide maintenance tools and accessories supplied by hardware component manufacturer.
   3. Delivery, storage, and protection: Comply with OWNER’s requirements for delivery, storage and protection of extra service materials.

PART 2 – PRODUCTS

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2.01 MANUFACTURERS

A. The following manufacturers are the basis of design subject to compliance with requirements of the Contract Documents. Approval of manufacturers other than those listed shall be in accordance with the front end documents.

Item:	Manufacturer:	Approved:
Hinges	Stanley	Bommer, McKinney
Locksets	Corbin Russwin	No Substitute
Cylinders	Corbin Russwin	No Substitute
Exit Devices	Corbin Russwin	Von Duprin, Sargent, Precision
Closers	Corbin Russwin	LCN 4110, Norton 7500
Protection Plates	Trimco	Burns, Rockwood
Overhead Stops	ABH	Rixson, Glynn Johnson
Door Stops	Ives	Burns, Rockwood
Threshold & Gasketing	National Guard	Reese, Zero

2.02 MATERIALS

A. Hinges: Shall be five knuckle ball bearing hinges
   1. Template screw hole locations
   2. Bearings are to be fully hardened.
   3. Bearing shell is to be consistent shape with barrel.
   4. Minimum of two permanently lubricated non-detachable bearings on standard weight hinge and four permanently lubricated bearing on heavy weight hinges.
   5. Equip with easily seated, non-rising pins.
   6. Non removable pin screws shall be slotted stainless steel screws.
   7. Hinges shall be full polished, front, back and barrel.
   8. Hinge pin is to be fully plated.
   9. Bearing assembly is to be installed after plating.
   10. Sufficient size to allow 180-degree swing of door
   11. Furnish five knuckles with flush ball bearings
   12. Provide hinge type as listed in schedule.
   13. Furnish three hinges per leaf to 6 foot 8 inch height. Add one for each additional 30 inches in height or fraction thereof.
   14. Tested and approved by BHMA for all applicable ANSI Standards for type, size, function and finish
   15. UL10C listed for fire rated doors.

B. Cylindrical Type Locks and Latchsets:
   1. Tested and approved by BHMA for ANSI A156.2, Series 4000, Operational Grade 1, Extra-Heavy Duty, and be UL10C listed.
   2. Provide 9001-Quality Management and 14001-Environmental Management.
   3. Fit modified ANSI A115.2 door preparation.
   4. Locksets and cores to be of the same manufacturer to maintain complete lockset warranty
   5. Locksets to have anti-rotational studs that are thru-bolted

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6. Keyed lever shall not have exposed “keeper” hole
7. Each lever to have independent spring mechanism controlling it
8. 2-3/4 inch (70 mm) backset
9. 9/16 inch (14 mm) throw latchbolt
10. Provide sufficient curved strike lip to protect door trim
11. Outside lever sleeve to be seamless, of one-piece construction made of a hardened steel alloy
12. Keyed lever to be removable only after core is removed, by authorized control key
13. Provide locksets with 7-pin removable and interchangeable core cylinders
14. Hub, side plate, shrouded rose, locking pin to be a one-piece casting with a shrouded locking lug.
15. Locksets outside locked lever must withstand minimum 1400 inch pounds of torque. In excess of that, a replaceable part will shear. Key from outside and inside lever will still operate lockset.
16. Core face must be the same finish as the lockset.
17. Functions and design as indicated in the hardware groups.

C. Exit Devices:
1. Exit devices to meet or exceed BHMA for ANSI 156.3, Grade 1.
2. Exit devices to be tested and certified by UL or by a recognized independent laboratory for mechanical operational testing to 10 million cycles minimum with inspection confirming Grade 1 Loaded Forces have been maintained.
3. Exit devices chassis to be investment cast steel, zinc dichromate.
4. Exit devices to have stainless steel deadlocking ¾ inch through latch bolt.
5. Exit devices to be equipped with sound dampening on touchbar.
6. Touchpad to be “T” style constructed of architectural metal with matching metal end caps.
7. Touchbar assembly on wide style exit devices to have a ¼ inch clearance to allow for vision frames.
8. All exposed exit device components to be of architectural metals and “true” architectural finishes.
9. Provide strikes as required by application.
10. Fire exit hardware to conform to UL10C and UBC 7-2. UL tested for Accident Hazard.
11. Exit device to be heavy investment cast stainless steel. The strike is to be black powder coated finish.
12. Exit devices to have field reversible handing.
13. Provide heavy duty vandal resistant lever trim with heavy duty investment cast stainless steel components and extra strength shock absorbing overload springs. Lever shall not require resetting. Lever design to match locksets and latchsets.
14. Provide 9001-Quality Management and 14001-Environmental Management.
15. Vertical latch assemblies to have gravity operation, no springs.

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D. Cylinders
   1. Provide the necessary cylinder housings, collars, rings and springs as recommended by the manufacturer for proper installation.
   2. Provide the proper cylinder cams or tail piece as required to operate all locksets and other keyed hardware items listed in the hardware sets.
   3. Coordinate and provide as required for related sections.

E. Door Closers shall:
   1. Tested and approved by BHMA for ANSI 156.4, Grade 1
   2. UL10C certified
   3. Provide 9001-Quality Management and 14001-Environmental Management.
   4. Closer shall have extra-duty arms and knuckles
   5. Conform to ANSI 117.1
   6. Maximum 2 7/16-inch case projection with non-ferrous cover
   7. Separate adjusting valves for closing and latching speed, and backcheck
   8. Provide adapter plates, shim spacers and blade stop spacers as required by frame and door conditions
   9. Full rack and pinion type closer with 1½ inch minimum bore
   10. Mount closers on non-public side of door, unless otherwise noted in specification
   11. Closers shall be non-handed, non-sized and multi-sized.

F. Door Stops: Provide a dome floor or wall stop for every opening as listed in the hardware sets.
   1. Wall stop and floor stop shall be wrought bronze, brass or stainless steel.
   2. Provide fastener suitable for wall construction.
   3. Coordinate reinforcement of walls where wall stop is specified.
   4. Provide dome stops where wall stops are not practical. Provide spacers or carpet riser for floor conditions encountered

G. Over Head Stops: Provide a Surface mounted or concealed overhead when a floor or wall stop cannot be used or when listed in the hardware set.
   1. Concealed overhead stops shall be heavy duty bronze or stainless steel.
   2. Surface overhead stops shall be heavy duty bronze or stainless steel.

H. Kickplates: Provide with four beveled edges ANSI J102, 10 inches high by width less 2 inches on single doors and 1 inch on pairs of doors. Furnish oval-head countersunk screws to match finish.

I. Seals: All seals shall be finished to match adjacent frame color. Seals shall be furnished as listed in schedule. Material shall be UL listed for labeled openings.

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J. Weatherstripping: Provide at head and jambs only those units where resilient or flexible seal strip is easily replaceable. Where bar-type weatherstrip is used with parallel arm mounted closers install weatherstrip first.
   1. Weatherstrip shall be resilient seal of (Neoprene, Polyurethane, Vinyl, Pile, Nylon Brush, Silicone)
   2. UL10C Positive Pressure rated seal set when required.

K. Door Bottoms/Sweeps: Surface mounted or concealed door bottom where listed in the hardware sets.
   1. Door seal shall be resilient seal of (Neoprene, Polyurethane, Nylon Brush, Silicone)
   2. UL10C Positive Pressure rated seal set when required.

L. Thresholds: Thresholds shall be aluminum beveled type with maximum height of ½ inch for conformance with ADA requirements. Furnish as specified and per details. Provide fasteners and screws suitable for floor conditions.

M. Silencers: Furnish silencers on all interior frames, 2 for pairs. Omit where any type of seals occurs.

2.03 FINISH

A. Designations used in Schedule of Finish Hardware - 3.05, and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18 including coordination with traditional U.S. finishes shown by certain manufacturers for their products.

B. Powder coat door closers to match other hardware, unless otherwise noted.

C. Aluminum items shall be finished to match predominant adjacent material. Seals to coordinate with frame color.

2.04 KEYES AND KEYING

A. Provide keyed brass construction cores and keys during the construction period. Construction control and operating keys and core shall not be part of the OWNER's permanent keying system or furnished in the same keyway (or key section) as the OWNER's permanent keying system. Permanent cores and keys (prepared according to the accepted keying schedule) will be furnished to the OWNER.

B. Cylinders, removable and interchangeable core system

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C. Permanent keys and cores: Stamped with the applicable key mark for identification. These visual key control marks or codes will not include the actual key cuts. Permanent keys will also be stamped "Do Not Duplicate."

D. Transmit grand masterkeys, masterkeys and other security keys to OWNER by registered mail, return receipt requested.

E. Furnish keys in the following quantities:
   1. 1 each grand masterkeys
   2. 6 each masterkeys
   3. 2 each change keys each keyed core
   4. 15 each construction masterkeys
   5. 2 each control keys

F. The CONTRACTOR shall install permanent cores and return the construction cores to the Hardware Supplier. Construction cores and keys remain the property of the hardware supplier.

G. Keying Schedule: Arrange for a keying meeting, and programming meeting with ENGINEER Owner and hardware supplier, and other involved parties to ensure locksets and locking hardware, are functionally correct and keying and programming complies with project requirements. Furnish 3 typed copies of keying and programming schedule to ENGINEER.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verification of conditions: Examine doors, frames, related items and conditions under which Work is to be performed and identify conditions detrimental to proper and or timely completion.
   1. Do not proceed until unsatisfactory conditions have been corrected.

3.02 HARDWARE LOCATIONS

A. Mount hardware units at heights indicated in the following publications except as specifically indicated or required to comply with the governing regulations.
   1. Recommended Locations for Builder’s Hardware for Standard Steel Doors and Frames, by the Door and Hardware Institute (DHI).
   2. Recommended locations for Architectural Hardware for flush wood doors (DHI).
   3. WDMA Industry Standard I.S.-1A-04, Industry Standard for Architectural wood flush doors.

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3.03 INSTALLATION

A. Install each hardware item per manufacturer's instructions and recommendations. Do not install surface mounted items until finishes have been completed on the substrate. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

B. Conform to local governing agency security ordinance.

C. Install Conforming to ICC/ANSI A117.1 Accessible and Usable Building and Facilities.
   1. Adjust door closer sweep periods so that from the open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the landing side of the door.

D. Installed hardware using the manufacturers fasteners provided. Drill and tap all screw holes located in metallic materials. Do not use “Riv-Nuts” or similar products.

E. Thresholds: Apply continuous bead of sealant to all contact surfaces before installing.

3.04 FIELD QUALITY CONTROL AND FINAL ADJUSTMENT

A. CONTRACTOR/Installers, Field Services: After installation is complete, CONTRACTOR shall inspect the completed door openings on site to verify installation of hardware is complete and properly adjusted, in accordance with both the Contract Documents and final shop drawings.
   1. Check and adjust closers to ensure proper operation.
   2. Check latchset, lockset, and exit devices are properly installed and adjusted to ensure proper operation.
      a. Verify levers are free from binding.
      b. Ensure latchbolts and dead bolts are engaged into strike and hardware is functioning.
   3. Report findings, in writing, to ENGINEER indicating that all hardware is installed and functioning properly. Include recommendations outlining corrective actions for improperly functioning hardware if required.

3.05 SCHEDULE OF FINISH HARDWARE

A. Manufacturer List

Code	Name
CR	Corbin Russwin
IV	Ives
BE	Best Access Systems

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CA	Cal Royal
NA	National Guard
PR	Precision
SD	Stanley Door Closers
ST	Stanley
TR	Trimco

B. Finish List

Code	Description
AL	Aluminum
626	Satin Chromium Plated
630	Satin Stainless Steel
689	Aluminum Painted
US32D	Stainless Steel, Dull

C. Option List

Code	Description
FL	Fire Exit Hardware
HC	Hurricane Code Device
LD	Less Dogging
S3	ANSI Strike Package
WS	Wind Storm Listed (Miami-Dade/Florida)
3/4	3/4" THROW LATCH
36"	36" Door Width
B4E	BEVELED 4 EDGES - KICK PLATES
NRP	NON REMOVEABLE PIN STD/HEAVY WT HINGE
STS	STAINLESS PINS - 4 1/2", 5"
7'0"	7'0" HIGH Standard Door Height
S300	STD. STRIKE - RIM AND TOP OF SVR DEVICES
END CAPS	Set Stainless End Caps (for221SS, 229SS)
C-SUNK HOLES	COUNTER SINKING OF KICK and MOP PLATES

D. Hardware Sets

1.Electrical Building - SET #1 - Exterior, Double door

6 Hinges	STS FBB191 4 ½ X 4 ½ NRP	US32D	ST
1 Exit Device	ED5200	630	CR
2 Lockset	CL3300	626	CR
2 Door Closer	DC8000	689	CR
2 Kick Plate	KO050 10" X 1"LDW B4E C-SUNK	630	TR
2 Gasketing	5050 B @ Head and Jambs		NA
2 Drip Cap	16 A 4"ODW		NA
2 Brush Door Sweep	C627 A		NA
1 Saddle Threshold	171 @ Door Pair	AL	AA

END OF SECTION 08710

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SECTION 09110

NON-LOAD-BEARING STEEL FRAMING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes non-load-bearing steel framing members for the following applications:
   1. Interior framing systems (e.g., supports for partition walls, framed soffits, furring, etc.) Interior suspension systems (e.g., supports for ceilings, suspended soffits, etc.).

1.02 SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.01 NON-LOAD-BEARING STEEL FRAMING, GENERAL

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
   1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
   2. Protective Coating: Coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40], hot-dip galvanized, unless otherwise indicated.

2.02 SUSPENSION SYSTEM COMPONENTS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch-diameter wire, or double strand of 0.0475-inch- diameter wire.

B. Grid suspension systems are suitable for use with gypsum board. They might not be acceptable for gypsum veneer plaster; consult gypsum veneer plaster and grid suspension system manufacturers before specifying them.

C. Grid Suspension System for Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Armstrong World Industries, Inc.; Drywall Grid Systems.
      b. Chicago Metallic Corporation; Drywall Furring System.
      c. USG Corporation; Drywall Suspension System.

2.03 STEEL FRAMING FOR FRAMED ASSEMBLIES

A. Steel Studs and Runners: ASTM C 645.
   1. Minimum Base-Metal Thickness: 0.027 inch.
   2. Depth: As indicated on Drawings (3-5/8 inches and 6 inches.

2.04 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide the following:
   1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

3.03 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.
   1. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C 844 that apply to framing installation.
   2. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.04 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

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1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
    a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
    a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
3. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

E. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.05 INSTALLING FRAMED ASSEMBLIES

A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

B. Install studs so flanges within framing system point in same direction.
    1. Space studs as follows:
        a. Single-Layer Application: 16 inches o.c., unless otherwise indicated.
        b. Tile backing panels: 16 inches o.c., unless otherwise indicated.

C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
    1. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
        a. Install two studs at each jamb, unless otherwise indicated.
        b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
        c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
    2. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

D. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

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SECTION 09110

NON-LOAD-BEARING STEEL FRAMING

END OF SECTION 09110

SECTION 09211

GYPSUM WALLBOARD AND SHEATHING ASSEMBLIES

PART 1 - GENERAL

1.01 SUMMARY

A. Description of Scope and intent:
   1. CONTRACTOR to provide all material, labor, and tools required to complete the installation of specified system.
   2. Any omission of reference to items required to complete the full operational and functional system specified in the section does not relieve the CONTRACTOR of the obligation to provide same.
   3. To provide installation of all items, including delivery, dispersing to the proper locations within the building, and affixing in place.
   4. Installation shall be accomplished by workers skilled in their craft that will perform their work in a professional manner and will leave the premises safe, orderly and clean.
   5. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section
   6. CONTRACTOR is responsible for coordination of work included in this specification with all other specification sections related to furnishing of all materials, labor, permits, fees and services necessary for completion of work in this section.
   7. In the event of a conflict between the design drawings, referenced standards and these Specifications, the more stringent shall govern unless directed otherwise by the Architect. CONTRACTOR shall strictly adhere to OSHA requirements and local codes or those of any regulatory agency or body with jurisdiction.

B. This Section includes the following:
   1. Interior paper faced standard gypsum board panels.
   2. Standard paper faced gypsum board panels.
   3. Standard paper faced gypsum finishing.
   4. Exterior fiberglass reinforced and faced gypsum board sheathing.

1.02 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For the following products:
   1. Trim Accessories: Full-size sample in 12-inch- long length for each trim
   accessory indicated.
   2. Final Finishes: Two (2) foot square for each finish and on same backing indicated for Work.

1.03 QUALITY ASSURANCE

A. Sound Transmission Characteristics: For standard paper faced gypsum board

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assemblies with STC ratings, provide materials and construction tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.

1. STC-Rated Assemblies:
    a. Walls, partitions, and floor/ceiling assemblies shall have a sound transmission class (STC) of not less than the following for air-borne noise when tested in accordance with ASTM E 90: Forty-five (45) STC
    b. Floor/ceiling assemblies between rooms shall have an impact insulation class (IIC) rating of not less than 60 (55 if field tested) when tested in accordance with ASTM E 492.

B. Standard Paper Faced Gypsum Board Finish Mockups: Before finishing gypsum board assemblies, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and qualities of materials and execution.

1. Install mockups for the following applications:
    a. Vertical and horizontal surfaces indicated to receive nontextured paint finishes.
    b. Install at corner condition where paperless and paper faced wall panels abut.
2. Simulate finished lighting conditions for review of mockups.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

1.05 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturers written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

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PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Gypsum Wallboard and Related Products:
   1. Georgia Pacific.
   2. United States Gypsum Co.
   3. Or equivalent manufacturer

2.02 INTERIOR PAPER FACED GYPSUM WALLBOARD

A. See schedule at end of specification for material types and locations.

2.03 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.
   1. Material: PVC by Plastic Components, Inc., AMICO Vinyl Bead Accessories, Trim-Tex Inc., or equivalent.
   2. Shapes:
      a. Cornerbead: Use at outside corners.
      b. LC-Bead: J-shaped; exposed long flange receives joint compound; use at exposed panel edges.
      c. L-Bead: L-shaped; exposed long leg receives joint compound; use where indicated.
      d. Expansion (Control) Joint: Use where indicated, or at maximum spacing of 30 feet. Where sound or fire ratings are prime considerations, provide adequate protection behind joint.
      e. Reveal Bead: U-shaped, ½" deep x ½" wide, let into rigid insulation in pattern shown on reflected ceiling plans, long legs on each side receive joint compound on surface.
   3. Provide and install gypsum board expansion joints in walls at 24'-0" maximum.

2.04 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475.

B. Joint Tape:
   1. Interior Gypsum Wallboard: Standard Paper Faced.

C. Joint Compound for all Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
   1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
   2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
      a. Use setting-type compound for installing nonpaper-faced metal trim accessories.
   3. Fill Coat: For second coat, use sandable topping compound.

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4. Finish Coat: For third coat, use sandable topping compound.

2.05 ACOUSTICAL SEALANT

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   1. Acoustical Sealant for Exposed and Concealed Joints:
      a. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
      b. United States Gypsum Co.; SHEETROCK Acoustical Sealant or equivalent.
   2. Acoustical Sealant for Concealed Joints:
      a. Ohio Sealants, Inc.; Pro-Series SC-170 Rubber Base Sound Sealant.
      b. Pecora Corp.; BA-98.
      c. Tremco, Inc.; Tremco Acoustical Sealant or equivalent.

B. Acoustical Sealant for Exposed and Concealed Joints: Nonsag, paintable, nonstaining, latex sealant complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

2.06 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

C. Isolation Strip at Exterior Walls:
   1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit stud size.

D. Thermal Insulation: As specified in Division 7 Section "Building Insulation."

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and substrates, with Installer present, and, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.02 PREPARATION

A. Furnish concrete inserts and other devises indicated for suspended ceiling systems to other trades for installation in advance of time needed for coordination and construction.

3.03 INSTALLING STEEL FRAMING, GENERAL

A. Installation Standards: See Structural Specification requirements that apply to framing installation.

3.04 INSTALLING SUSPENDED CEILING

A. Suspend steel suspension framing system from building structure required by system manufacturer and structural drawings.

3.05 APPLYING AND FINISHING PANELS, GENERAL

A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.

B. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

D. Install gypsum panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

E. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

F. Attach gypsum panels to framing provided at openings and cutouts.

G. Form control and expansion joints as necessary, with space between edges of adjoining gypsum panels.

H. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch-wide spaces at these locations, and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control and expansion joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters

and through penetrations. Comply with ASTM C 919 and manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above ceilings.

J. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.
   1. Space screws a maximum of 12 inches o.c. for vertical applications.

3.06 PANEL APPLICATION METHODS

A. Single-Layer Application:
   1. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
   2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
      a. Stagger abutting end joints not less than one framing member in alternate courses of board.
      b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.

B. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.07 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

3.08 FINISHING STANDARD PAPER FACED GYPSUM BOARD ASSEMBLIES

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Pre-fill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:

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1. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view, unless otherwise indicated.

3.09 FIELD QUALITY CONTROL

A. Above-Ceiling Observation: Before CONTRACTOR installs gypsum board ceilings, Architect will conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling gypsum board until deficiencies have been corrected.
   1. Notify Architect seven (7) days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.
   2. Notify Architect prior to installation of building insulation scheduled to be installed directly above gypsum board ceilings.
   3. Before notifying Architect, complete the following in areas to receive gypsum board ceilings:
      a. Installation, insulation, and leak and pressure testing of water piping systems.
      b. Installation of air-duct systems.
      c. Installation of mechanical system.
      d. Installation of ceiling support framing.

PART 4 - SCHEDULE

4.01 GYPSUM WALLBOARD AND SHEATHING SCHEDULE

A. Provide the following material at all interior locations requiring gypsum board panels.
   1. Interior, Standard, Paper Faced Gypsum Board panels equal to:
      a. Georgia Pacific “Tough-Rock”.
      b. Thickness: 5/8” unless otherwise noted.
      c. Long edges: tapered.
      d. Non-fire rated.

B. Provide the following material at all locations requiring exterior gypsum board sheathing including soffits, fascias and suspended exterior ceilings.
   1. Interior, Paperless Gypsum Board panels equal to:
      a. Georgia Pacific “Dens Glass Gold”.
      b. Thickness: ½”.

C. Note: Other requirements for sheathing and wallboard are specified in Section 07411 Metal Roof Panels.

END OF SECTION 09211

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SECTION 09512

ACOUSTICAL TILE CEILINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Description of Scope and Intent:
   1. CONTRACTOR to provide all material, labor, and tools required to complete the installation of specified system.
   2. Any omission of reference to items required to complete the full operational and functional system specified in the section does not relieve the CONTRACTOR of the obligation to provide same.
   3. To provide installation of all items, including delivery, dispersing to the proper locations within the building, and affixing in place.
   4. Installation shall be accomplished by workers skilled in their craft who will perform their work in a professional manner and will leave the premises safe, orderly and clean.
   5. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section
   6. CONTRACTOR is responsible for coordination of work included in this specification with all other specification sections related to furnishing of all materials, labor, permits, fees and services necessary for completion of work in this section.

B. Section Includes:
   1. Acoustical tiles
   2. Suspended metal grid ceiling system

1.02 DEFINITIONS

A. CAC: Ceiling Attenuation Class.

B. LR: Light Reflectance coefficient.

C. NRC: Noise Reduction Coefficient.

D. AC: Articulation Class

1.03 SUBMITTAL

A. Product Data: For each type of product specified.

B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
   1. Ceiling suspension system members.
   2. Method of attaching hangers to building structure.
      a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
   3. Size and location of initial access modules for acoustical tile.

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4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
5. Minimum Drawing Scale: 1/8 inch = 1 foot

C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below. Samples should show the full range of variations expected in these characteristics.
1. Acoustical Tile: Set of Samples of each type, color, pattern, and texture, minimum 6inch by 6-inch size.
2. Suspension System Members: 12-inch- long Sample of each type.
3. Exposed Moldings and Trim: Set of 12-inch- long Samples of each type and color.

D. Qualification Data: For firms and persons specified in “Quality Assurance” Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specific to those projects.

E. Maintenance Data: For finishes to include in maintenance manuals.

F. Certification: Signed by manufacturer that products meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Engage an installer with a minimum of 5-years documented experience who has completed acoustical tile ceilings similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Source Limitations for Ceiling Units and Suspension Systems: Obtain acoustical each type of ceiling tile and supporting suspension system through one source for warranty purposes with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

C. Mockups: If requested, build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

D. Fire-Test-Response Characteristics: Provide acoustical tile ceilings that comply with the following requirements:
1. Surface-burning characteristics of acoustical tiles comply with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84.
a. Smoke-Developed Index: 450 or less.

E. Pre-installation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section “Project Meetings.”

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1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical tiles, suspension system to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical tiles, permit them to reach room temperature and stabilized moisture content.

C. Handle acoustical tiles carefully to avoid chipping edges or damaging units in any way.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical tile ceilings and components until spaces are enclosed and weatherproof, wet-work in spaces is complete and dry, work above ceilings is complete, areas are free of construction dust and debris and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
   1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical tile ceiling installation, when applicable.

1.07 COORDINATION

A. Coordinate layout and installation of acoustical tiles, suspension system and accent canopies with other construction that penetrates ceilings or is supported by them, including but not limited to: light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.08 EXTRA MATERIALS

A. Deliver extra materials to OWNER. Extra materials are to be packaged with protective covering for storage and identified with labels describing contents.

1.09 WARRANTY

A. Warranty period:
   1. Grid and ceiling tile: 15 – year minimum from date of substantial completion.

B. The warranty shall not deprive the OWNER of other rights the OWNER may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the CONTRACTOR under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.01 Available Manufacturers: Subject to compliance with requirements, manufacturers offering

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products that may be incorporated into the Work include, but are not limited to, the following:

A. Ceiling tile units:
   1. Armstrong World Industries, Inc.
   2. USG Interiors, Inc.
   3. Chicago Metallic Corporation

B. Suspension Systems:
   1. Armstrong World Industries, Inc.
   2. USG Interiors, Inc.
   3. Chicago Metallic Corporation

2.02 ACOUSTICAL TILES, GENERAL

A. Acoustical Tile Standard: Provide manufacturer's standard tiles of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectance, unless otherwise indicated.

B. Acoustical Tile Colors and Patterns: Match appearance characteristics indicated for each product type.

C. Tile Characteristics: Comply with requirements indicated in the Acoustical Tile Ceiling Schedule at the end of Part 3, including those referencing ASTM E 1264 classification.

2.03 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements: Armstrong Prelude 15/16" exposed Tee grid system as indicated, or equivalent.

B. Suspension System: Intermediate; non-fire rated; exposed T components die cut and interlocking; size as specified; commercial quality cold rolled hot dipped galvanized steel; double web construction; baked polyester paint finish. Light gauge steel cross tees shall have rotary stitches to improve column strength and staked on end detail allowing easy cross tee removal and remounting.

C. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

D. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung, unless otherwise indicated.

E. Support Channels and Hangers: Galvanized carbon steel; size and type to suit application to rigidly secure acoustic ceiling system including integral mechanical and electrical components.

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2.04 TILE UNIT MATERIALS:

A. Acoustic tile (ACT-1): Armstrong “Fine Fissured” #1820, or equivalent, with Prelude 15/16" tee grid; humidity resistant Humigard Plus performance; Bio-block paint on face and back to inhibit mold and mildew growth:
   1. Size: 24” x 24”
   2. Thickness: 3/4”
   3. Composition: Mineral fiber
   4. Average Light reflectance: 0.85
   5. NRC: 0.70 Acoustical performance
   6. CAC: 35
   7. AC: N/A
   8. Fire hazard classification: Class A
   9. Edge: Angled tegular
   10. Surface color: white
   11. Surface finish: Medium texture; non-directional pattern

B. Acoustic tile (ACT-2): “Armstrong Fine Fissured Ceramaguard” Un-perforated #605 with Prelude 15/16" tee grid, or equivalent; humidity resistant: Humigard Max performance; totally inorganic material to resist the growth of mold and mildew; washable, scrub-able and soil-resistant. To be provided in areas prone to moisture.
   1. Size: 24” x 24”
   2. Thickness: 5/8”
   3. Composition: Ceramic and mineral fiber composite
   4. Light reflectance: 0.88
   5. NRC: N/A
   6. CAC: 40
   7. Fire hazard classification: Class A
   8. Edge: Square lay-in
   9. Surface color: white
   10. Surface finish: Medium texture; non-directional pattern

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and structural framing to which acoustical tile ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage, and other conditions affecting performance of acoustical tile ceilings.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.
   2. Beginning of installation means installer accepts conditions.

3.02 PREPARATION

A. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other Sections.
   1. Furnish concrete inserts and similar devices to other trades for installation

well in advance of time needed for coordinating other work. Provide additional hangers and inserts as required.

B. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width units at borders, and comply with layout shown on reflected ceiling plans.

3.03 INSTALLATION

A. General: Install acoustical tile ceilings to comply with ASTM C636, manufacturer's written instructions and as supplemented in this section.

B. Suspend ceiling hangers from building's structural members and as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
   2. Install system capable of supporting imposed load to a deflection of 1/360 of the span.
   3. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counter splaying, or other equally effective means.
   4. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
   5. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure; that are appropriate for substrate; and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
   6. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
   7. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, powder-actuated fasteners, or drilled-in anchors that extend through forms into concrete.
   8. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
   9. Do not attach hangers to steel deck tabs.
   10. Do not attach hangers to steel roof deck. Attach hangers to structural members
   11. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; and provide hangers not

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more than 8 inches from ends of each member.

12. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Install edge moldings at perimeter of acoustical tile ceiling area and where necessary to conceal edges of acoustical units.
   1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
   2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
   3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

E. Arrange colored/patterned acoustical tiles as indicated on reflected ceiling plans, if applicable.

F. Center system on room axis leaving equal border units unless shown otherwise on the reflected ceiling plan.

G. Install acoustical tiles in coordination with suspension system and exposed moldings and trim. Place splines or suspension system flanges into kerfed edges so tile-to-tile joints are closed by double lap of material.
   1. Fit adjoining tile to form flush, tight joints. Scribe and cut tile for accurate fit at borders and around penetrations through tile.
   2. Hold tile field in compression by inserting leaf-type, spring-steel spacers between tile and moldings, spaced 12 inches o.c.

H. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

I. Install hold down clips to retain panels tight to grid system within 20’-0” of an exterior door.

3.04 CLEANING

A. Clean exposed surfaces of acoustical tile ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer’s written instructions for cleaning and touchup of minor finish damage. Remove and replace tiles and other ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

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PART 4 – SCHEDULE

4.01 ACOUSTICAL TILE CEILING SCHEDULE

A. Refer to AD-1 for locations of types ACT-1 and ACT-2 in each room.

B. Coordinate the penetration of the acoustical ceiling where ducts are noted to be vented, refer to reflected ceiling plan. Provide escutcheon rings to create a finished installation. No exposed raw edges of acoustical tile will be accepted.

NOTE: Finishes to be selected/verified upon receipt of submittals and shop drawings. Upon receipt of all interior finish submittals by the Architect, colors will be selected.

END OF SECTION 09512

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SECTION 09580

DRYWALL SUSPENSION SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. Description of Scope and Intent:
   1. CONTRACTOR to provide all products, material, labor, and tools required to complete the installation of this specified system.
   2. Any omission of reference to items required to complete the full operational and functional system specified in the section does not relieve the CONTRACTOR of the obligation to provide same.
   3. To provide installation of all items, including delivery, dispersing to the proper locations within the building, and affixing in place.
   4. Installation shall be accomplished by workers skilled in their craft who will perform their work in a professional manner and will leave the premises safe, orderly and clean.
   5. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section
   6. CONTRACTOR is responsible for coordination of work included in this specification with all other specification sections related to furnishing of all materials, labor, permits, fees and services necessary for completion of work in this section.

B. This Section includes:
   1. Pre-engineered drywall suspension system consisting of main tees along with straight furring cross channels or cross tees, that join together to support screw attached gypsum board panels and independently supported light fixtures and air diffusers where applicable.
      a. Suspension system framing and furring for plaster and gypsum board assemblies
      b. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings

1.02 SUBMITTALS

A. Product Data: Submit MANUFACTURER’s technical data for each type of product indicated.

B. Samples: Submit actual samples of suspension system components including main runner, cross tees and angle molding

C. Shop Drawings: Indicate installation details, accessory attachments and installation of related lighting fixtures and related mechanical system components.

D. Maintenance Data: For finishes to include in maintenance manuals.

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1.03 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of suspended system from one source with resources to provide products of consistent quality in appearance, physical properties, and performance.

B. Installer Qualifications: Engage an installer with a minimum of (5) five-years documented experience to perform work of this Section who has specialized in installing suspension and drywall systems similar to those required for this Project and with a record of successful in-service performance.

C. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination".

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver suspension and drywall system components to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Handle components in such a manner to insure against racking, distortion or physical damage of any kind.

1.05 PROJECT CONDITIONS

A. Environmental Limitations: Do not install suspension and drywall system until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.06 COORDINATION

A. Coordinate layout and installation of suspension and drywall system with other construction that penetrates ceilings or is supported by them, including but not limited to light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

B. Mechanical Work: Ductwork above system shall be complete and permanent HVAC systems operating.

C. Electrical work: Installation of conduit above suspension system shall be complete before installation of suspension system.

1.07 WARRANTY

A. Warranty Period: ten years from date of substantial completion

B. The warranty shall not deprive the OWNER of other rights the OWNER may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the CONTRACTOR under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, those indicated below.
   1. USG Drywall suspension system.
   2. Armstrong Drywall suspension system

2.02 MATERIALS

A. Grid Fabrication: Commercial Quality cold rolled steel, hot dipped galvanized finish.

B. Drywall Suspension System Standard: Provide double-web construction, hot dipped galvanized, metal suspension systems of types and finishes indicated that comply with applicable ASTM A 635 requirements. Provide systems complete with runners or beams, splice sections, connector clips, alignment clips, leveling clips, hangers, molding, trim, web covers, load-resisting struts, fixture filler pans, clips and adapters, and other suspension components required to support ceiling units and other ceiling-supported construction.

C. Gypsum panels: Manufactured in accordance with ASTMC36 in sizes and types as indicated on drawings with trim and fasteners for the thickness of the material specified and as recommended by the system manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas to receive materials for conditions which will adversely affect installation. Do not start work until unsatisfactory conditions are corrected.

B. Work to be concealed: Verify work above ceiling suspension system is complete and installed in a manner which will not affect layout and installation of suspension system components.

C. Fire-rating requirements: construction above fire-rated assembly shall meet requirements as applicable to provide fire-resistance ratings specified.

D. Beginning of installation means installers acceptance of conditions.

3.02 PREPARATION

A. Field dimensions must be verified prior to installation.

3.03 INSTALLATION

A. General: Install suspension system and panels in accordance with the MANUFACTURER's instructions, in compliance with ASTM installation standard, and with applicable codes as required by the authorities having jurisdiction.

B. Install in accordance with approved shop drawings and locate ceiling in accordance with main tee dimensions relative to elevations.

C. Install main beams and cross tees at the on center spacing required for ceiling loading and location of in-ceiling services. Provide additional bracing as required by code.

D. Suspend ceiling hangers from building's structural members and as follows:
   1. Main tees shall be spaced a maximum of 48" on center and supported by hangers not more than 48 inches on center and as specified by UL Fire resistance Directory attaching hanger wires directly to structure above.
   2. Do not support grids directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, powder-actuated fasteners, or drilled-in anchors that extend through forms into concrete.
   3. Install hanger wire as required with necessary on center spacing to support expected ceiling load requirements following local practices, codes and regulations. Provide additional wires at light fixtures, grilles and access doors where necessary.
   4. Do not attach hangers to steel deck tabs.
   5. Do not attach hangers to steel roof deck. Attach hangers to structural members.

E. Transitions: When constructing stepped soffits, bracing of the drywall suspension and/or additional hanger wires may be necessary to ensure stability and structural performance during and after drywall attachment. Maximum soffit height is 48". Intermediate cross tees are not necessary when soffit dimensions do not exceed 24".

F. Apply gypsum panels per the MANUFACTURER's instructions. Attach gypsum panels to the suspension system main runners, cross tees and cross channels with conventional gypsum panel fasteners spaced 8" on center at periphery of gypsum panels and located 3/8" in from panel edges. Space fasteners at 12" on center in the field.

G. Control and Expansion Joints: Provide a separation in the suspension system at expansion joints as shown on the drawings and carry the joint through the gypsum panels.

H. Accessories: Install accessories as applicable to meet project requirements.

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3.04 SCHEDULE

A. Provide Drywall Suspension system for all gypsum board ceilings as indicated on the Reflected Ceiling Plan and Details.

B. Coordinate the installation of the suspension system with other construction associated with the drywall ceiling system or is supported by them, including but not limited to, light fixtures, fire suppression systems and partition assemblies.

END OF SECTION 09580

SECTION 09900

PAINTING

PART 1 - GENERAL

1.01 SCOPE

A. Perform all work necessary and required for completion of the project as indicated. Work includes furnishing all materials and equipment and the application and completion of all painting and painter's finish on all exposed exterior and interior surfaces as required to complete the finishing as shown and noted on the Drawings and specified herein.

B. The grade and number of coats of paint to be applied at assigned locations and on different materials, and the kind of materials to be supplied shall conform to this section.

C. The manholes, new concrete influent structure, and new concrete wet wells shall be coated as per Section 03446.

D. Pre-engineered metal building requirements may extend the coating requirement and include Kynar 500.

1.02 SUBMITTALS

A. Type of material to be applied at each location shall be submitted to the OWNER with the manufacturer's written recommendation of the type of paint for each item to be painted. The submittal shall include a "Paint Color Schedule" as specified herein.

B. All colors will be selected by the OWNER from color chips to be submitted by the CONTRACTOR.

C. The paint manufacturer's submittal shall include a "Paint Color Schedule" of the format shown below, listing all information indicated for each item to be painted:

PAINT COLOR SCHEDULE

Structure	Surface	Dwg. No.	Manufacturer's Product for Final Coat	Color Selection (By Owner)

1.03 PRODUCT HANDLING

A. All painting materials shall be delivered to the site in the manufacturer's original containers with labels intact and seals unbroken. They shall be kept in a locked, well-ventilated storage place assigned for this purpose. Receiving, opening, and mixing of all paint materials shall be done in this room. Storage space shall be kept clean and neat. Oily rags shall be removed and disposed of each day, and all other necessary precautions shall be taken to avoid danger of fires.

1.04 ENVIRONMENTAL CONDITIONS

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A. Surfaces shall be painted only when they are free from moisture. No painting on exterior surfaces shall be done within less than 72 hours of adequate drying weather after a rain, nor during periods of dew or fog. Receiving surfaces shall be properly dried out before proceeding with the work. No painting shall be done when temperature is below 50 degrees F., except when specifically authorized otherwise in writing by the CONTRACTOR. Clear sealer shall not be applied when air temperature is less than 70 Degrees F. Moisture in walls shall be registered with a meter to determine if they are moisture free. When manufacturer's require minimum humidity limits for application of paint, CONTRACTOR shall provide and maintain records of conditions when applications are made.

1.05 SCAFFOLDING AND PROTECTION

A. Furnish, maintain and remove all scaffolding, ladders and planks required for this work, and all drop cloths for the protection of concrete walks, floors, prefinished materials, building fixtures, etc. Painted and finished surfaces subject to damage or defacement due to other work on the building shall be properly protected and covered. CONTRACTOR shall be responsible for any and all damage to painted work and to that of other work caused by operations under this Section. All surfaces not to be painted shall be kept entirely free of paint by adequate temporary coverage including areas a minimum of 1 inch from joints to subsequently be welded in material coated with zinc base coatings.

1.06 WORK IN CONFINED SPACES

A. The CONTRACTOR shall, when work is located in confined spaces, provide and maintain safe working conditions for all employees. Fresh air ventilation shall be provided to continuously remove paint fumes from the confined space through the combined use of existing openings, forced-draft fans and temporary ducts to the outside. Paint fumes shall, if possible, be exhausted to the outside from the lowest level in the confined space. Electrical fan motors shall, if located in the confined space, be explosion proof. No smoking or open fires will be permitted in the confined space.

1.07 COMPATIBILITY OF SHOP AND FIELD PAINTS

A. To ensure a satisfactory painting job, it is essential that the paints applied in the shop and in the field be mutually compatible. The shop coats to be applied by others shall be suitable for the field coats to be applied under this Contract.

1.08 GUARANTEE

A. Paint on all piping systems and interior and exterior concrete masonry units shall be guaranteed for five (5) years.

1.09 APPLICATOR QUALIFICATIONS

A. The coating application contractor shall be trained in application techniques and procedures of coating materials and shall demonstrate a minimum of 5 years

successful experience in such application. The CONTRACTOR shall provide the following references:

1. Five (5) water/wastewater treatment facilities that have been in service for at least 5 years. The projects shall have had been of the same size and scope as the current project. The projects must have utilized the same surface preparation and application techniques required by these project specifications. All references shall include the following information:
   a. Name of Project.
   b. Project Location
   c. Owner Name
   d. Owner Address
   e. Owners Phone Number
   f. Owner Contact
   g. Engineering Firm
   h. Engineering Firm Address and Phone Number
   i. Engineering Firm Contact.

B. The CONTRACTOR shall provide the following information regarding the personnel performing the work:
   1. Project foreman name
   2. Project foreman experience in high performance coating application
   3. Projects completed by the foreman of like scope in the last 5 years.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. The paints and paint products of the *Tnemec Company, Inc.,* mentioned in the following specifications are considered to be the design standard for this work. Other acceptable manufacturers are Corrocoat, Sherwin Williams INDUSTRIAL, PPG, or Carboline. No request for substitution will be considered which decreases the film thickness and/or the number of coats to be applied, or which offers a change from the generic type of coating specified. Request for substitution shall contain the following:
   1. FULL NAME OF EACH PRODUCT
   2. DESCRIPTIVE LITERATURE
   3. DIRECTIONS FOR USE
   4. GENERIC TYPE
   5. NON VOLATILE CONTENT BY VOLUME
   6. PERFORMANCE DATA LISTED IN SECTION 2.03.

B. Submittals shall include a side by side comparison of the performance attributes of the proposed materials as compared to the specified coatings.

C. Products of other manufacturers may be acceptable provided that they meet the generic type of material specified and the performance requirements outline in Section 2.03 of these specifications.

2.02 SUBSTITUTIONS

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A. Comply with the General Conditions, and the requirements of Section 2.01 and Section 2.03 when requesting substitutions.
B. Obtain review prior to purchase and delivery.

2.03 COATING MATERIALS

A. Tnemec Series 1 Omnithane
   1. Generic Type: NSF Approved Aromatic Moisture Cured Urethane Primer
   2. Special Qualifications: Certified in accordance with NSF/ANSI std 61 for potable water applications.
   3. Performance Criteria
      a. Adhesion: ASTM D 4541.
      b. Humidity: ASTM D 4585. 5,000 hours exposure.
      c. Salt Spray (Fog): ASTM B 117. 10,250 hours exposure
      d. Impact: ASTM D 2794.

B. Tnemec Series 91 H20 Hydro-Zinc
   1. Generic Type: Moisture Cured Zinc Rich Urethane
   2. Special Qualifications: Certified in accordance with NSF/ANSI std 61 for potable water applications.
   3. Zinc Dust: ASTM D520 Type III
   4. Performance Criteria:
      a. Adhesion: ASTM D4541 (Elcometer):
      b. Immersion: ASTM D 870. 7 years
      c. Humidity: ASTM D 4585. 4,000 hours exposure.
      d. Salt Spray (Fog): ASTM B 117: 50,000 hours exposure.
      e. Prohesion: ASTM G 85. 15,000 hours.

C. Tnemec Series N140 Pota-Pox Plus
   1. Generic Type: Polyamidoamine Epoxy.
   2. Special Qualifications: Certified in accordance with NSF/ANSI std 61 for potable water applications.
   3. Performance Criteria:
      a. Abrasion: ASTM D4060, (CS-17 Wheel, 1,000 grams load, 1,000 cycles)
      b. Adhesion: ASTM D4541 (Elcometer)
      c. Immersion: ASTM D 870. 2 years
      d. Exterior Exposure: 5 years
      e. Humidity: ASTM D 4585. 10,000 hours exposure.
      f. Salt Spray (Fog): ASTM B 117: 10,000 hours exposure.
      g. Moisture Vapor Transmission: ASTM D 1653
      h. Prohesion: ASTM G 85. 5,000 hours.

D. Tnemec Series 66 Epoxoline
   1. Generic Type: Polyamide Epoxy.
   2. Performance Criteria:
      a. Abrasion: ASTM D4060, (CS-17 Wheel, 1,000 grams load, 1,000 cycles)
      b. Adhesion: ASTM D4541 (Elcometer)
      c. Immersion: ASTM D 870. 7 years
      d. Exterior Exposure (45 degrees facing south): 6 years

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e. Humidity: ASTM D 4585. 4,500 hours exposure.
f. Salt Spray (Fog): ASTM B 117: 10,000 hours exposure.
g. Moisture Vapor Transmission: ASTM D 1653
h. Prohesion: ASTM G 85. 5,000 hours.

E. Tnemec Series 297 Enviro-Glaze
1. Generic Type: Ceramic Modified Waterborne Aliphatic Urethane
2. Performance Criteria:
a. Abrasion: ASTM D4060, (CS-17 Wheel, 1,000 grams load, 1,000 cycles)
b. Adhesion: ASTM D4541 (Elcometer)
c. Coefficient of Frication: ASTM D 2047
d. Flexibility: ASTM D 522 (Method A)
e. Impact: ASTM D 2794.
f. Scrubbability: ASTM D 4213 (1,000 cycles)
g. Moisture Vapor Transmission: ASTM D 1653
h. Steam Resistance: 250 F steam @ 15 – 17 psi. 4 hours.

F. Tnemec Series 434 Perma-Shield H2S
1. Generic Type: 100% Solids Modified Amine Epoxy
2. Performance Criteria:
a. Abrasion: ASTM D4060, (CS-17 Wheel, 1,000 grams load, 1,000 cycles)
b. Adhesion: ASTM D4541 (Elcometer)
c. Immersion (140 F DI Water): ASTM D 870. 2,000 hours.
d. Severe Wastewater Analysis Test: H2S Autoclave (150F, 500 ppm H2S, 4,000 ppm NaCl, 10% H2S04). 28 days exposure:
e. Salt Spray (Fog): ASTM B 117: 10,000 hours exposure.
f. Moisture Vapor Transmission: ASTM D 1653
g. Tensile Strength: ASTM D 2370
h. Water Absorption: ASTM C 413
i. Elongation: ASTM D 638
j. Chemical Immersion: NACE TM 0174 (5% Acetic Acid, 10% Sulfuric Acid, 20% Lactic Acid, 50% Citric Acid, 5% Nitric Acid, 5% Calcium Hydroxide)

G. Tnemec Series 435 Perma-Glaze
1. Generic Type: 100% Solids Modified Amine Epoxy
2. Performance Criteria:
a. Abrasion: ASTM D4060, (CS-17 Wheel, 1,000 grams load, 1,000 cycles)
b. Adhesion: ASTM D4541 (Elcometer)
c. Immersion (140 F DI Water): ASTM D 870. 2,000 hours.
d. Severe Waste Water Analysis Test: H2S Autoclave (150F, 500 ppm H2S, 4,000 ppm NaCl, 10% H2S04). 28 days exposure:
e. Salt Spray (Fog): ASTM B 117: 10,000 hours exposure.
f. Moisture Vapor Transmission: ASTM D 1653
g. Tensile Strength: ASTM D 2370
h. Water Absorption: ASTM C 413
i. Elongation: ASTM D 638
j. Chemical Immersion: NACE TM 0174 (5% Acetic Acid, 10% Sulfuric Acid, 20% Lactic Acid, 50% Citric Acid, 5% Nitric Acid, 5% Calcium Hydroxide)

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H. Tnemec Series 142 Epoxoline
   1. Generic Type: Modified Polyamine Epoxy
   2. Performance Criteria:
      a. Abrasion: ASTM D4060, (CS-17 Wheel, 1,000 grams load, 1,000 cycles)
      b. Adhesion: ASTM D4541 (Elcometer)
      c. Cyclic Salt Fog/UV Exposure: ASTM D 5894, 5,000 hours
      d. Edge Retention: MIL-PRF-23236, average of 3 tests
      e. Flexibility & Elongation: ASTM D 522 (Method A, Conical Mandrel)
      f. Hardness: ASTM D 2240: Shore D Hardness
      g. Humidity: ASTM D 4585. 2,000 hours
      h. Immersion (140 F DI Water): ASTM D 870. 1,000 hours.
      i. Immersion (Tap Water): ASTM D 870, 2 years.
      j. Salt Spray (Fog): ASTM B 117. 5,000 hours.

I. Tnemec - Series 1074U Endura-Shield II
   1. Generic Type: Aliphatic Acrylic Urethane
   2. Performance Criteria:
      a. Abrasion: ASTM D4060, (CS-17 Wheel, 1,000 grams load)
      b. Adhesion: ASTM D4541 (Elcometer)
      c. Exterior Exposure; ASTM D 1014 (EMMAQUA): 500 MJ/m2 UV exposure.
      d. Humidity; ASTM D4585 1,500 hours exposure.
      e. QUV Exposure; ASTM D 4587. 7,000 hours
      f. Salt Spray (Fog); ASTM B117: 5,000 hours exposure.
      g. Flexibility: ASTM D 522 (Method A)

J. Tnemec - Series 1094 Endura-Shield
   1. Generic Type: Aliphatic Acrylic Urethane
   2. Performance Criteria:
      a. Abrasion: ASTM D4060, (CS-17 Wheel, 1,000 grams load)
      b. Adhesion: ASTM D4541 (Elcometer)
      c. Exterior Exposure; ASTM D 1014 (EMMAQUA): 500 MJ/m2 UV exposure.
      d. Humidity; ASTM D4585 1,500 hours exposure.
      e. QUV Exposure; ASTM D 4587. 7,000 hours
      f. Salt Spray (Fog); ASTM B117: 5,000 hours exposure.
      g. Flexibility: ASTM D 522 (Method A)

K. Tnemec Series 113 H.B. Tneme-TufCoat
   1. Generic Type: Waterborne Acrylic Epoxy.
   2. Performance Criteria:
      a. Abrasion: ASTM D4060, (CS-17 Wheel, 1,000 grams load)
      b. Adhesion: ASTM D4541 (Elcometer)
      c. Exterior Exposure (45 degrees facing south): 3 years
      d. Humidity: ASTM D4585 1,000 hours exposure.
      e. Scrubbability: ASTM D 4213, 1,000 cycles.
      f. Stain Resistance: ASTM D 1308.
      g. Flexibility: ASTM D 522 (Method A)

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L. Tnemec Series 37H-77 Chem-Prime
   1. Generic Type: Modified Phenolic Rust Inhibitive Primer
   2. Performance Criteria:
      a. Abrasion: ASTM D4060, (CS-17 Wheel, 500 grams load)
      b. Adhesion: ASTM D4541 (Elcometer)
      c. Salt Spray (Fog): ASTM B 117, 275 hours
      d. Exterior Exposure (Exposed 45°Facing South): 3 years exposure.
      e. Humidity: ASTM D4585 2,000 hours exposure.

M. Tnemec Series 218 MortarClad
   1. Generic Type: 100% Epoxy Mortar
   2. Performance Criteria:
      a. Bond Strength: ASTM C 882
      b. Compressive Strength: ASTM C 579
      c. Freeze - Thaw: ASTM 666 Procedure A: 308 Cycles
      d. Thermal Expansion; ASTM C 531
      e. Tensile Strength, Elongation and Modulus of Elasticity: ASTM C 307 and ASTM D 638

N. Tnemec Series 130 EnviroFill
   1. Generic Type: Waterborne Cementitious Acrylic
   2. Performance Criteria:
      a. Adhesion: ASTM D3359, (Method B, Crosshatch)
      b. Freeze/Thaw: TTM 058, Method D: 30 cycles.
      c. Humidity: ASTM D4585: 1,500 hours exposure.
      d. Wind Driven Rain: TT-C-555B, 4.4.7.3; 24 hours

O. Tnemec Series 135 Chembuild
   1. Generic Type: Polyamidoamine.
   2. Performance Criteria:
      a. Abrasion: ASTM D4060, (CS-17 Wheel, 1,000 grams load, 1,000 cycles)
      b. Adhesion: ASTM D4541 (Elcometer): Rusty Steel, SSPC-SP2 Cleaned
      c. Flexibility: ASTM D 522 (Method B)
      d. Humidity: ASTM D 4585. 2,000 hours exposure.
      e. Salt Spray (Fog): ASTM B 117: SSPC-SP 2 Cleaned Uniformly Rusty Steel, 4,000 hours exposure.
      f. Moisture Vapor Transmission: ASTM D 1653
      g. Prohesion: ASTM G 85. 10,000 hours.

P. Tnemec Series 115 Uni-Bond
   1. Generic Type: Waterborne Cementitious Acrylic
   2. Performance Criteria:
      a. Adhesion: ASTM D4541
      b. Abrasion: ASTM D 4060
      c. Cyclic Salt Fog/UV Exposure: ASTM D 5894, 7,000 hours
      d. Salt Spray (Fog): ASTM B117.
      e. Humidity: ASTM D4585: 2,000 hours exposure.

Q. Tnemec Series 1095 Endura-Shield
   1. Generic Type: Aliphatic Acrylic Polyurethane

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2. Performance Criteria:
   a. Adhesion: ASTM D 4541, (Method E, Type V Tester)
   b. Cyclic Salt Fog/UV Exposure: ASTM D 5894, 5,376 hours
   c. Hardness: ASTM D 3363
   d. Humidity: ASTM D 4585
   e. Impact: ASTM D 2794
   f. Prohesion: ASTM G 85
   g. QUV Exposure: ASTM D 4587 (UVA-340 bulbs, 8 hours UV, 4 hours condensation)
   h. Salt Spray (Fog): ASTM B 117

2.04 COATING SCHEDULE EXTERIOR ENVIRONMENTS

A. Exterior Steel Surfaces, Non-submerged
   1. Surface Prep: SSPC-SP6
   2. Shop Primer – Series 91 H20 Hydro-Zinc (NSF approved zinc rich urethane primer), 2.5-3.5 mils.
   3. Field Primer – Series 91 H20 Hydro-Zinc (NSF approved zinc rich urethane primer), 2.5-3.5 mils.
   4. Intermediate Coat – 66 Epoxoline, 3.0-5.0 mils.
   5. Top Coat – Series 1094 Endura-Shield, 2.0-3.0 mils.
   6. Total Dry Film Thickness: 7.5 mils.
   7. Total Coats: Three (3)

B. Exterior Steel Doors and Frames (Shop Primed), Interior and Exterior
   1. Surface Prep: SSPC-SP6
   2. Primer – Series 135 Chembuild, 2.5-3.5 mils.
   3. Finish – Series 1094 Endura-Shield , two coats, 2.0 – 5.0 mils DFT per coat.
   4. Total Dry Film Thickness: 6.5 to 13.5 mils
   5. Total Coats: Three (3)

C. Ductile Iron Pipe, Non-Submerged
   1. SSPC-SP6
   2. Shop Primer – Series N140 Pota-Pox Plus (NSF approved polyamidoamine epoxy), 6.0 – 8.0 mils.
   3. Field Primer – Series N140 Pota-Pox Plus (NSF approved polyamidoamine epoxy), 6.0 – 8.0 mils.
   4. Intermediate – Series 66 Epoxoline, 3.0-5.0 mils.
   5. Finish – Series 1094 Endura-Shield, 2.0-3.0 mils
   6. Total Dry Film Thickness: 11.0 to 16.0 mils (Excluding Shop Primer).
   7. Total Coats: Three (3)

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D. Exterior Galvanized Substrates
   1. Surface Preparation: Abrasive blast referencing SSPC SP16 Abrasive Blasting Non-Ferrous Metals to provide uniform 1.0 mil angular anchor profile.
   2. First Coat: Tnemec Series 66 Epoxoline applied at 2.0 to 3.0 mils DFT.
   3. Second Coat: Tnemec Series 1074U or 1075U Endura-Shield II applied at 2.0 to 3.0 mils DFT.
   4. Finish: Tnemec Series 1074U or 1075U Endura-Shield II applied at 2.0 to 3.0 mils DFT.
   5. Total Dry Film Thickness: 6.0 to 9.0 mils DFT.
   6. Total Coats: Three (3)

E. Exterior Aluminum (Non-Anodized or Otherwise Coated) Substrates:
   1. Stripe Coat: Tnemec Series 66 Hi-Build Epoxoline applied at 2.0 to 3.0 mils DFT.
   2. Second Coat: Tnemec Series 66 Hi-Build Epoxoline applied at 2.0 to 3.0 mils DFT.
   3. Finish: Tnemec Series 1074U or 1075U Endura-Shield II applied at 2.0 to 5.0 mils DFT.
   4. Total Dry Film Thickness: 4.0 to 6.0 mils DFT.
   5. Total Coats: Three (3)

F. Exterior PVC Piping, Non-Submerged and Above Grade
   1. Surface Preparation: SSPC-SP1 Solvent Cleaning followed by hand or power tool cleaning to scarify and de-gloss the surface
   2. Coat: Tnemec Series 1095 Endura-Shield applied at 2.4 to 3.5 mils DFT.
   3. Total Dry Film Thickness: 5.0 to 7.0 mils DFT.
   4. Total Coats: Two (2)

2.05 COATING SCHEDULE – INTERIOR SYSTEMS ALL PLANT ENVIRONMENTS

A. Interior Steel Doors and Frames (Shop Primed)
   1. Surface Prep: SSPC-SP6
   2. Primer – Series 37H-77 Chem-Prime, 2.5 to 3.5 mils.
   3. Finish – Series 2H Tneme-Gloss, two coats, 2.0 to 3.0 mils DFT per coat.
   4. Total Dry Film Thickness: 6.5 to 9.5 mils
   5. Total Coats: Three (3)

B. Interior Concrete Surfaces and Masonry Substrates:
   1. Surface Prep: SSPC-SP13
   2. Block Filler – Series 130 EnviroFill, as required to create a pinhole free surface.
   3. Intermediate Coat – Tnemec Series 113 H.B. Tneme-TufCoat, 4.0 to 6.0 mils DFT.
   4. Finish – Tnemec Series 297 Enviro-Glaze, 2.0 to 3.0 mils DFT.
   5. Total Dry Film Thickness: 6.0 to 9.0 mils (not including block filler).
   6. Total Coats: Three (3)

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C. Interior Steel Substrates (Shop Primed):
   1. Surface Preparation: SSPC-SP6.
   2. Prime Coat – Tnemec Series 135 ChemBuild applied at 4.0 to 6.0 mils DFT.
   3. Finish – Tnemec Series 1094 Endura Shield at 2.0 to 5.0 mils DFT.
   4. Total Dry Film Thickness: 6.0 to 11.0 mils (not including block filler).
   5. Total Coats: Two (2)

D. Ductile Iron Pipe, Non-Submerged
   1. Surface Preparation: SSPC-SP6
   2. Shop Primer – Series N140 Pota-Pox Plus (NSF approved polyamidoamine epoxy), 6.0 – 8.0 mils.
   3. Field Primer – Series N140 Pota-Pox Plus (NSF approved polyamidoamine epoxy), 6.0 – 8.0 mils.
   4. Intermediate – Series 66 Epoxoline, 3.0-5.0 mils.
   5. Finish – Series 1094 Endura-Shield, 2.0-3.0 mils
   6. Total Dry Film Thickness: 11.0 to 16.0 mils (Excluding Shop Primer).
   7. Total Coats: Three (3)

E. Interior Gypsum Board Substrates (Standard Exposure):
   1. Surface Prep: Clean and dry
   2. Prime Coat: Tnemec Series 151-1051 Elasto-Grip applied at 1.0 to 2.0 mils DFT.
   3. Intermediate Coat: Tnemec Series 113 H.B. Tneme TufCoat applied at 4.0 to 6.0 mils DFT.
   4. Finish: Tnemec Series 113 H.B. Tneme TufCoat applied at 4.0 to 6.0 mils DFT.
   5. Total Dry Film Thickness: 9.0 to 14.0 mils DFT.

2.06 IMMERSION COATING SCHEDULE – WASTEWATER TREATMENT PLANTS AND PUMP STATIONS

A. Steel Surfaces, Submerged in Wastewater
   1. Surface Prep: SSPC-SP6
   2. Shop Primer – Series 1 Omnithane (NSF approved mio/zinc MCU Primer), 2.5-3.5 mils.
   3. Field Primer – Series 1 Omnithane (NSF approved mio-zinc MCU Primer), 2.5-3.5 mils.
   4. Stripe Coat – Series 66 Epoxoline, 2.0 – 4.0 mils DFT applied by brush to all weld seams, sharp edges and other difficult to coat areas.
   5. Intermediate Coat – Series 66 Epoxoline, 4.0 – 6.0 mils DFT
   6. Finish – Series 142 Epoxoline, 10.0 to 12.0 mils DFT
   7. Total Dry Film Thickness: 18.5 to 25.5 mils.
   8. Total Coats: Three (3) plus a stripe coat

B. Ductile Iron Pipe, Submerged (Wastewater)
   1. Surface Prep: SSPC-SP6
   2. Shop Primer – Series N140 Pota-Pox Plus (NSF approved polyamidoamine epoxy), 6.0 – 8.0 mils.
   3. Field Primer – Series N140 Pota-Pox Plus (NSF approved polyamidoamine epoxy), 6.0 – 8.0 mils.
   4. Intermediate – Series 66 Epoxoline, 5.0 to 6.0 mils DFT
   5. Finish – Series 142 Epoxoline, 10.0 to 12.0 mils DFT

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6. Total Dry Film Thickness: 21.0 to 26.0 mils.
7. Total Coats: Three (3)

C. Moderate Concrete Surface, Submerged (Wastewater)
1. Refer to Section 03446 for severe submerged concrete surface coating requirements.

D. Severe Concrete Surface, Submerged (Wastewater)
1. Refer to Section 03446 for severe submerged concrete surface coating requirements.

2.07 MIXING AND TINTING

A. Deliver paints and enamels ready-mixed to job site except epoxies.

B. Mix only in mixing pails placed in suitably sized non-ferrous or oxide resistant metal pans.

C. Use tinting colors recommended by manufacturer for the specific type of finish.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine surfaces scheduled to receive paint and finishes for conditions that will adversely affect execution, permanence or quality of work and which cannot be put into an acceptable condition through preparatory work as included in Paragraph 3.02, PREPARATION OF SURFACES.

B. Do not proceed with surface preparation or coating application until conditions are suitable.

3.02 PREPARATION OF SURFACES

A. Wood
1. Clean soiled surfaces (with alcohol wash).
2. Sand to smooth and even surface then dust off.
3. Apply shellac, not over two pounds cut to all knots, pitch and resinous sapwood before prime coat is applied.
4. Fill nail holes, cracks, open joints and other defects with wood filler after priming coat has dried. Color to match finish color.

B. Plaster and Gypsum Wallboard
1. Fill narrow, shallow cracks and small holes with spackling compound.
2. Rake deep, wide cracks and deep holes.
a. Plaster: Fill with thin layers of patching plaster.
b. Gypsum Wallboard: Fill with thin layers of drywall joint cement.
c. Allow to dry.
d. Sand smooth. Do not raise nap of paper on wallboards.

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C. Concrete
1. All concrete surfaces to be coated shall be clean and dry. All oil, grease, dirt, etc., shall be removed either by steam cleaning with detergent or by scrubbing with a strong commercial type detergent and flushing with water. All chemical contamination shall be neutralized and flushed.
2. Old paint and unremoved tar stains shall be solvent cleaned with naphtha, trichloroethylene, or perchloroethylene. Proper safety precautions shall be observed if this step is necessary. The surface shall be flushed with fresh water and dried.
3. Rough, chemically attacked and/or abraded floor and tank interior shall be rebuilt. If a newly poured concrete surface contains air, water pits, splatter, protrusions or other surface irregularities, it shall be rebuilt while the concrete is still "green". Rebuilding shall consist of the following:
    a. Smooth the concrete surface, breaking down all rough protrusions.
    b. The entire area shall be sandblasted to remove loose, powdery concrete and open sub-surface air holes (Reference SSCP-SP 13, ICRI CSP 5). Dust shall be removed from the blasted surface by vacuuming or blowing with dry, oil-free air.
    c. Areas where the aggregate is exposed or deep pot holes exist shall be resurfaced utilizing Tnemec Series 217 MortarCrete applied in accordance with the manufacturer’s instructions.
4. Concrete surfaces which do not require rebuilding shall be properly prepared. This preparation shall be done in accordance with the coating manufacturer's latest written Application Instructions.
    a. Proper preparation shall consist of either mechanically abrading or sandblasting for horizontal surfaces.
    b. Non-Immersion Service: Proper preparation shall consist of sandblasting to open all bug holes and voids and to provide an adequate surface profile (Reference SSPC-SP 13, ICRI CSP 2 – 3).
    c. Non-Immersion Service (Exterior Concrete Basins): Proper preparation shall consist of sandblasting to open all bug holes and voids and to provide an adequate surface profile (Reference SSPC-SP 13, ICRI CSP 3 – 5).
    d. Immersion Service: For concrete in immersion, all surfaces shall be abrasive blasted to remove all form release agents, curing compounds, laitance, and to provide a surface profile (Reference SSPC-SP 13, ICRI CSP 5). Remove all loose materials.
5. Concrete shall be fully cured prior to coating. Fully cured shall be defined as: 28 days at 75 Deg. F., or 40 days at 50 Deg. F., or equal. If concrete admixtures or concrete substitutes are used, increase the cure time by 1/3.
6. The concrete surfaces shall be thoroughly dried and cured before application of the coating.

D. Steel Surfaces
1. Remove any oil or grease from surfaces to be coated by solvent cleaning in accordance with Steel Structures Painting Council Specification SP 1-65. Any chemical contamination shall be eliminated by means of neutralization or flushing or both prior to additional surface preparation.
2. For immersion service, all sharp edges and welds shall be ground smooth to a rounded contour and all weld splatter shall be removed prior to sandblasting.

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3. For non-immersion service, all sharp edges and welds shall be ground and all weld splatter shall be removed prior to sandblasting.
4. For immersion service, all surfaces to be coated shall be sandblasted to white metal in accordance with Steel Structures Painting Council Specification SP 5-63 or National Association of Corrosion Engineers Specification NACE No. 1 unless otherwise stated in the coating manufacturer's most recent printed Application Instructions or material shall be pickled in accordance with SP-8-63.
5. For non-immersion or intermittent service in a moist area or wherever specified in the coating manufacturer's most recent printed Application Instructions for other services, all surfaces to be coated shall be sandblasted to a finish near white in accordance with Steel Structures Painting Council Specifications SP 10-63 or National Association of Corrosion Engineers Specification NACE No. 2.
6. For non-immersion service, or wherever specified in the coating manufacturer's most recent printed Application Instructions, all surfaces to be coated shall be sandblasted to a commercial sandblast in accordance with Steel Structures Painting Council Specification SP 6-63 or National Association of Corrosion Engineers Specification NACE No. 3.
7. Steel surfaces previously exposed to sulfides shall be sandblasted, flame cleaned, and sandblasted again in accordance with the recommended surface preparation for the particular service in question.
8. After sandblasting, dust and spent sand shall be removed from the surfaces by brushing or vacuum cleaning. The prime coat shall be applied as soon as possible after the blasting preparation is finished and always before the surface starts to rust. No sandblasted surface shall stand overnight before coating.

E. Hot Steel Surfaces
1. Surface preparation shall be SSPC-SP-5-63, white metal abrasive blast.

3.03 APPLICATION

A. General Requirements
1. Do not apply initial coating until moisture content of surface is within limitations recommended by paint manufacturer.
   a. Test with moisture meter
2. Apply paint, enamel, stain and varnish with suitable brushes, rollers, or spraying equipment.
   a. Rate of application shall not exceed that as recommended by paint manufacturer for the surface involved less ten percent allowance.
   b. Keep brushes, rollers and spraying equipment clean, dry, free from contaminates and suitable for the finish required.
   c. Apply stain by brush.
3. Comply with recommendations of product manufacturer for drying time between succeeding coats.
4. Where possible, vary slightly the color of successive coats.
5. Sand and dust between each coat to remove defects visible from a distance of 5 feet.

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6. Finish coats shall be smooth, free of brush marks, streaks, laps or pile up of paints, and skipped or missed areas.
    a. Finished metal surface shall be free of skips, voids or pinholes in any coat when tested with a low voltage detector.
7. Inspection
    a. Do not apply additional coats until completed coat has been inspected by the ENGINEER.
    b. Only inspected coats of paint will be considered in determining number of coats applied.
8. Leave all parts of moldings and ornaments clean and true to details with no undue amount of paint in corners and depressions.
9. Make edge of paint adjoining other materials or colors clean and sharp with no overlapping.
10. Apply primer on all work before glazing.
11. Change colors at doors where colors differ between adjoining spaces or rooms and where door frames match wall colors.
12. Refinish whole wall where portion of finish has been damaged or is not acceptable.
13. Hardware, trim and other items shall be removed as required for proper application of coatings.
14. Field Touch-Up Painting:
    a. Prior to applying finish coats of paint, areas where prime coat has been damaged shall be sanded smooth and touched up with the same primer applied at the shop.
    b. Remove rust before above specified touch-up is applied.
    c. Touch-up shall not be obvious.

B. Painted Work
1. Back prime all exterior woodwork with oil base primer.
2. Runs on face not permitted.

3.04 CLEANING

A. Remove spilled, splashed, or splattered paint from all surfaces.

B. Do not mar surface finish of item being cleaned.

C. Leave storage space clean and in condition required for equivalent spaces in project.

D. Oily rags, waste, etc., shall be removed at end of each working day.

3.05 PAINTING SCHEDULE

A. General
1. Painting of Piping and Equipment
    a. The CONTRACTOR shall paint all piping, covering, pumps, motors, fans, duct work, including fiber glass duct work, foundations, hangers, supports and all miscellaneous equipment throughout the building and the covering of all concealed piping, or duct work, and all uncovered pipe and duct work in accessible pipe spaces, roof, etc., installed under Mechanical Piping, and Heating and Plumbing specifications. Ducts,

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pipe and pipe covering installed in completely furred - ceilings, and vertical shafts will not be painted.

b. All pumps, fans, motors and other mechanical apparatus furnished under the heating and plumbing specifications, shall be painted three coats, one prime coat and two finished coats of machinery enamel, or color as directed.

c. Identification lettering and directional flow arrows on heating and plumbing piping shall be by Heating and Plumbing Contractors. All other piping - see color code.

d. Painting or coatings shall not apply to stainless steel, aluminum, or galvanized steel.

2. Miscellaneous Painting
   a. All metal doors other than aluminum shall be painted with two coats.
   b. The painting of exposed panel board faces (aluminum excepted) shall be included.
   c. The painting of all sheet metal work, radiators, convector enclosures, all pipes and pipe covering in all exposed portions of the building, except as otherwise noted, shall be included within this contract.
   d. The painting of all ducts, pipe and pipe covering occurring in accessible pipe spaces is included under this Contract. Ducts, pipe and pipe covering installed in completely furred-in ceiling and vertical shafts will not be painted. The equipment furnished under the Plumbing, Heating and Electrical Contracts will be painted under this section except as otherwise noted.
3. Painting of Electrical Conduit, Boxes and Equipment
   a. The CONTRACTOR shall paint all conduit work, junction and pull boxes, bus duct, iron work hangers, supports, panel fronts, and all other miscellaneous equipment of the electrical system throughout the finished portions of the building.
   b. All identification lettering of electrical equipment shall be by the Electrical Contractor.
4. Parking Lot Striping (as applicable)
   a. Painting of striping within parking areas shall be to design indicated by ENGINEER.
   b. Lines shall be four (4) inches wide applied in one coat.
   c. Handicap area to be painted blue with a white handicap logo.

B. Standard Color Schedule
1. Architectural Painting: Color charts shall be submitted to the Architect for review with the OWNER for final color selections.
2. The following color scheme in pipe painting is recommended for purposes of standardization:

Pipe Description	Color Designation
Air	Green
Drains	Dark Gray
Plant Reclaimed Water	Pantone Purple
Potable Water	Blue
Raw Sewage	Green
Pumps	Match Pipe Color

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a. In situations where two colors do not have sufficient contrast to easily differentiate between them, a six-inch band of contrasting color shall be placed on one of the pipes at approximately 30 inch intervals.
b. The name of the liquid or gas, with arrows indicating the direction of flow, shall also be indicated on the pipe.

3. Building and Architectural Components
   a. All building colors shall be determined by the OWNER during construction. Other colors, if not identified in appropriate Specification Sections, shall be selected by the ENGINEER and approved by the OWNER.

C. Finishing Schedule
   1. The following items (new) shall be painted in accordance with Painting Specifications.
      a. Influent Structure
         1) Concrete in a corrosive environment (submerged)
            All walls (full height) and floors
            Section 03446 Specialty Coatings and Linings
         2) Interior exposed metal surfaces
         3) Exterior exposed above grade PVC piping
      b. Wet Well
         1) Concrete in a corrosive environment (submerged)
            All walls (full height) and floors
            Section 03446 Specialty Coatings and Linings
         2) Submerged piping and mixers (except stainless steel components)
         3) Exterior exposed above grade valves
         4) Interior submerged metal surfaces
         5) Exterior exposed above grade PVC piping
         6) Interior and exterior exposed metal surfaces
      c. Diesel Pump Piping
         1) Exterior exposed above grade valves
         2) Exterior exposed metal surfaces
      d. Precast Electrical Building
         1) Interior walls and ceilings
         2) Exterior walls and roof
      e. Existing Influent Pump Station
         1) Exterior exposed above grade valves
         2) Interior and exterior exposed metal surfaces

END OF SECTION 09900

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SECTION 10200

LOUVERS AND VENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Description of scope and intent:
   1. CONTRACTOR shall provide all material, labor, and tools required to complete the installation of specified system.
   2. Any omission of reference to items required to complete the full operational and functional system specified in the section does not relieve the CONTRACTOR of the obligation to provide same.
   3. To provide installation of all items, including delivery, dispersing to the proper locations within the building, and affixing in place.
   4. Installation shall be accomplished by workers skilled in their craft that will perform their work in a professional manner and will leave the premises safe, orderly and clean.
   5. Drawings and general provisions of Contract, including EJCDC Standard General and Supplemental Conditions and Division 1 Specification Sections, apply to this Section.
   6. CONTRACTOR is responsible for coordination of work included in this specification with all other specification sections related to furnishing of all materials, labor, permits, fees and services necessary for completion of work in this section.
   7. In the event of a conflict between the design drawings, referenced standards, and these Specifications, the more stringent shall govern unless directed otherwise by the Architect. CONTRACTOR shall strictly adhere to OSHA requirements and local codes or those of any regulatory agency or body with jurisdiction.

B. Section Includes:
   1. Fixed extruded aluminum hurricane louvers, impact test approved.
   2. Insect screens.

1.02 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Horizontal Louver: Louver with horizontal blades; i.e., the axes of the blades are horizontal.

C. Vertical Louver: Louver with vertical blades.

D. Storm-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing per AMCA 500-L.

1.03 PERFORMANCE REQUIREMENTS

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A. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.
   1. Wind Loads: Determine loads based on a uniform pressure as shown on structural drawings.

B. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width per AMCA 500-L.

C. All exterior louvers located within thirty (30) feet of grade shall meet requirements of the Florida Building Code, 2014 (latest edition) impact-resisting standard or the Large Missile Test of ASTM E 1996.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.
   1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.
   1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
   2. Show mullion profiles and locations.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of metal finish required.

E. Delegated-Design Submittal: For louvers indicated to comply with structural performance requirements and design criteria, including analysis data signed and sealed by the qualified professional structural engineer responsible for their preparation. Structural engineer shall be registered in the State of Florida.

F. Product Test Reports: Based on evaluation of comprehensive tests performed per AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.

G. Florida Product Approval Number: Submitted louvers shall have a valid Florida product approval number.

1.05 QUALITY ASSURANCE

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A. Source Limitations: Obtain louvers and vents from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

B. Welding: Qualify procedures and personnel per the following:
   1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

1.06 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5, T-52, or T6.

B. Aluminum Sheet: ASTM B 209, Alloy 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Aluminum Castings: ASTM B 26/B 26M, Alloy 319.

D. Fasteners: Use sizes to suit unit installation conditions.
   1. For all fastening, use 300 series stainless-steel fasteners.
   2. For color-finished louvers, use fasteners with heads that match color of louvers.

E. Post-installed Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.02 FABRICATION, GENERAL

A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Maintain equal louver blade spacing**,** including separation between blades and frames at head and sill, to produce uniform appearance.

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C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
   1. Frame Type: Channel unless otherwise indicated.

D. Include supports, anchorages, and accessories required for complete assembly.

E. Join frame members to each other and to fixed louver blades with welds concealed from view, threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.03 FIXED, EXTRUDED ALUMINUM LOUVERS

A. Drainable blades
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product by Construction Specialties, Inc, Model DC-7024 (including A4080 Front Unit), or equivalent product by another manufacturer.
   2. Total Louver Depth: Eleven (11) inches.
   3. Frame and Blade Nominal Thickness: Not less than 0.080 inch for blades and 0.125 inch for frames.
   4. Louver Performance Ratings:
      a. Free Area: Not less than 6.50 sq. ft. for 48-inch-wide by 48-inch-high louver.
   5. Blade Profile: Extra performance drainable blade.
   6. Blade Spacing: 4 inches o.c.
   7. Mullion Type: N/A.

2.04 LOUVER SCREENS

A. General: Provide screen at each exterior louver indicated.
   1. Screen Location for Fixed Louvers: Interior face.
   2. Screening Type: Insect screening.

B. Secure screen frames to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches from each corner and at 12 inches o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.
   1. Metal: Same kind and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
   2. Finish: Same finish as louver frames to which louver screens are attached.
   3. Type: Re-wirable frames with a driven spline for insert screens.

D. Louver Screening for Aluminum Louvers:
   1. Insect Screening: Stainless steel, 18”-by-18”, 0.009-inch wire.

2.05 FINISHES, GENERAL

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A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. All items shall be finished in Kynar 500 with color selected by owner.

2.06 ALUMINUM FINISHES

A. Two (2) coat Fluoropolymer Kynar 500 or Hylar 5000 from a full range of industry colors.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. All work shall be coordinated with the PEMB and secondary framing approved by the PEMB.

3.02 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.03 INSTALLATION

A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

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F. Protect unpainted galvanized and nonferrous-metal surfaces that will be in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Division 7 Section "Joint Sealants" for sealants applied during louver installation.

3.04 ADJUSTING AND CLEANING

A. Test operation of adjustable louvers and adjust as needed to produce fully functioning units that comply with requirements.

B. Clean exposed surfaces of louvers and vents that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

C. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

D. Restore louvers and vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
   1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 10200

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SECTION 10281

TOILET ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Description of scope and intent:
   1. CONTRACTOR shall provide all material, labor, and tools required to complete the installation of specified system.
   2. Any omission of reference to items required to complete the full operational and functional system specified in the section does not relieve the CONTRACTOR of the obligation to provide same.
   3. To provide installation of all items, including delivery, dispersing to the proper locations within the building, and affixing in place.
   4. Installation shall be accomplished by workers skilled in their craft who will perform their work in a professional manner and will leave the premises safe, orderly and clean.
   5. Drawings and general provisions of Contract, including EJCDC General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
   6. CONTRACTOR is responsible for coordination of work included in this specification with all other specification sections related to furnishing of all materials, labor, permits, fees and services necessary for completion of work in this section.

B. This section includes:
   1. Toilet accessories.
   2. Under lavatory guards.
   3. Custodial accessories.

1.02 SUBMITTALS

A. Submit all shop drawings in accordance with Section 01300.

B. Product Data: Include construction details, material descriptions and thickness, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.

C. Setting Drawings: For cutouts required in other work; include templates, substrate preparation instructions, and directions for preparing cutouts and installing anchoring devices.

D. Product Schedule: Indicating types, quantities, sizes and installation locations by room of each accessory required. Use designations indicated in the toilet accessory schedule and room designations indicated on Drawings in accessory schedule.

E. Provide maintenance data for accessories; include in maintenance manuals specified in Section 01730. Provide lists of replacement parts and service recommendations.

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F. Product Certificate: Signed by manufacturer certifying that products furnished meet or exceed the specified requirements.

1.03 QUALITY ASSURANCE

A. Product Options: Accessory requirements, including those for materials, finishes, dimensions, capacities, and performance, are established by specific products indicated in the Toilet Accessory Schedule.

B. Interior toilet room accessories shall conform to ADA and all other applicable codes for provisions of the physically handicapped.

1.04 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of accessories. Notify the Architect in writing of any conflicts concerning product placement for resolution. Do not proceed without resolution.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.05 WARRANTY

A. General Warranty: 15 years from the date of substantial completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design:
   1. Manufacturers: The Basis of Design, subject to compliance with requirements, of the following manufacturers offering accessories that may be incorporated into the Work include, but are not limited to, the following:
   2. Toilet Accessories:
      a. Undersink Piping Cover: Basis of Design: TRUEBRO, INC.; Lav Shield, White. Shall cover all pipes under counter which might injure by burning cutting or puncturing individuals who are confined to wheel chairs.
      b. Toilet Accessories and Grab Bars: Basis of Design: Bradley, Bobrick, or equal by others.

B. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, those indicated in the Toilet and Bath Accessory Schedule at the end of Part 3.

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2.02 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, with No. 4 finish (satin), in 0.0312-inch minimum nominal thickness, unless otherwise indicated.

B. Concealed Galvanized Steel Sheet: ASTM A 653/A 653M, G90.

C. Chromium Plating: ASTM B 456, Service Condition Number SC 2 (moderate service), nickel plus chromium electrodeposited on base metal.

D. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

E. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

2.03 FABRICATION

A. General: One, maximum 1-1/2-inch-diameter, unobtrusive stamped manufacturer logo, as approved by Architect, is permitted on exposed face of accessories. On interior surface not exposed to view or back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.

B. Surface-Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.

C. Keys: Provide universal keys for internal access to accessories for servicing and re-supplying. Provide minimum of three (3) keys to Owner’s representative.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set units level, plumb, and square at locations indicated, according to manufacturer’s written instructions for substrate indicated.

C. Install grab bars to withstand a downward load of at least 250 lbs., when tested according to method in ASTM F 446.

D. Correct unsatisfactory substrate conditions before start of accessory installation.

E. Beginning of installation means installer’s acceptance of surfaces/ substrate.

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3.02 ADJUST AND CLEAN

A. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to MANUFACTURER's written recommendations.

3.03 TOILET AND BATH ACCESSORY SCHEDULE

A. Refer to the toilet accessory schedule on the architectural drawings for specific model number and Manufacturers.

END OF SECTION 10281

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SECTION 10522

FIRE-PROTECTION SPECIALTIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of this Contract, including Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Portable fire extinguishers and cabinets
   2. Surface mounted fire extinguisher mounting bracket

1.03 SUBMITTALS

A. Provide submittals in accordance with Section 01300 including:
   1. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection cabinets.
      a. Fire extinguishers and surface mounted fire extinguisher cabinets: Include rating and classification.
      b. Fire extinguisher bracket
   2. Samples for Initial Selection: For fire-protection cabinets with factory-applied color finishes.
   3. Maintenance Data: O&M manuals in accordance with Section 01730.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain fire extinguishers and fire-protection brackets through one source from a single manufacturer.

B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers".

C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
   1. Provide fire extinguishers approved, listed, and labeled by FMG.
   2. Provide and install class ABC 10 lb. fire extinguishers with brackets or surface mounted cabinets as indicated in Section 03480.

1.05 COORDINATION

A. Coordinate size of fire-protection brackets or cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

1.06 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of portable fire extinguishers that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:

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a. Failure of hydrostatic test per NFPA 10.
b. Faulty operation of valves or release levers.

2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Painted steel bracket and aluminum fire extinguisher.

2.02 PORTABLE FIRE EXTINGUISHERS

A. Available Manufacturers:
1. JL Industries, Inc.
2. Kidde Fyrnetics.
3. Larsen's Manufacturing Company.

B. General: Provide fire extinguishers of type, size, and capacity for each indicated.
1. Handles and Levers: Manufacturer's standard.
2. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.
3. 10 lb dry chemical general-purpose fire extinguisher.

2.03 FIRE EXTINGUISHER BRACKETS

A. Available Manufacturers:
1. JL Industries, Inc.
2. Kidde Fyrnetics.
3. Larsen's Manufacturing Company.

B. Bracket Type: Suitable for fire extinguisher, painted steel bracket.

C. Accessories:
1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection wall, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish. Brackets to be used only in utility or storage spaces.
2. Surface Mounted Fire Extinguisher Cabinet – Maximum projection from the wall 9-inches; 10 lb. extinguisher size; clear plexiglass window; door and housing to be painted enamel finish; provide lettering on door. See above for acceptable manufacturers.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Install fire-protection specialties in locations and at mounting heights indicated or, if not indicated, at heights indicated below:

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1. Fire extinguisher: Maximum 54 inches above finished floor to actuator handle.

B. Fire Extinguisher Bracket: Fasten fire-protection brackets to face of masonry or precast concrete wall with “tapcon” type masonry screws, square and plumb.

END OF SECTION 10522

SECTION 11200

HORIZONTAL CENTRIFUGAL PUMPS FOR POTABLE WATER

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. Furnish, test, and put into operation four (4) electric motor-driven, horizontal (axially) suction pumps to serve as the high service pumps (HSP) and three (3) feed pumps to the RO skid system for the North Beach WTP. One HSP will be relocated from the existing pump building. The pumps shall be sized per Table 11200-1 and 11200-2.

B. The pump MANUFACTURER shall include, but not limited to, the following responsibilities in their scope of work:
   1. Shop drawing submittals to the OWNER per this Section and Section 01300
   2. Factory acceptance testing and submittal
   3. Coordination with the installing CONTRACTOR for any activities to deliver, install, and test the pump
   4. Provide anchoring and grouting recommendations to the CONTRACTOR
   5. Verification of system installation
   6. Alignment of pump and alignment report submittal
   7. Development of operation and maintenance information and manual submittals per Section 01730
   8. Observe and record data from functional demonstration, vibration, and performance testing; CONTRACTOR shall conduct testing, but MANUFACTURER shall provide a report of field testing performed by the CONTRACTOR.
   9. MANUFACTURER shall provide an authorized representative who has complete knowledge of the proper installation, operation, and maintenance of the equipment for required site visits detailed in this Section

C. The CONTRACTOR shall include, but not limited to, the following responsibilities in their scope of work:
   1. Coordination with the pump MANUFACTURER as required to provide a fully operation pump
   2. Equipment unloading, storage, and installation per the MANUFACTURER's recommendations
   3. Perform leveling and alignment with the support of the MANUFACTURER
   4. Repair any defects incurred during unloading, storage, and installation of the pump
   5. Coordinate with MANUFACTURER for an installation inspection and address any issues identified during the review
   6. Conduct field functional demonstration, vibration, and performance testing with support of the MANUFACTURER
   7. Overall commissioning of the installation including the pump and motor, valves, VFD, and controls

D. The units shall be furnished with all necessary accessory equipment including, but not limited to, the pump, motor, base plate, coupling, any specified sensors, spare parts, special tools and any other required ancillary components, whether specifically mentioned in this Section or not, as required for a complete operational system incorporating the highest standards for this type of service including field

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testing and instructing the regular operating personnel in the care, operation, and maintenance of all equipment. All complete pumping units shall be factory assembled and tested and shall be shipped in as large an assembly as practical to minimize field assembling effort.

1.02 RELATED WORK

A. Division 16 for electrical and instrumentation requirements.

1.03 DESCRIPTION OF SYSTEM

A. Three (3) new split case double suction pumping units are required under this CONTRACT for the HSPs. The pumping units shall be located and arranged as shown on the Drawings. The pumping units will draw suction from the ground storage tank(s) and discharge into a common header with the existing pumps to provide flow to the distribution network.

B. Three (3) new split case double suction pumping units are required under this CONTRACT for the RO feed pumps. The pumping units shall be located and arrange as shown on the Drawings. The pumping units will draw suction from the well manifold and discharge into the RO skid system or bypass header.

C. BID ALTERNATE: Two (2) new split case double suction pumping units are required under this CONTRACT for the GST feed pumps. The pumping units shall be located and arranged as shown on the Drawings. The pumping units will draw suction from the new degasifier vessel and discharge into the ground storage tank(s).

D. All components of the pump that come into contact with water shall be NSF 61 approved and certified. The pump manufacturer shall provide certification during the shop drawing process.

E. Pump materials should also be compatible with continuous chlorine concentration dosing between 2 and 4 mg/L. Initial disinfection of pump, which may include suction and discharge piping, shall be limited to concentration between 15-20 mg/L for 30 hours.

F. All working parts of the new pump and motor, such as bearings, wearing rings, shaft sleeves, motor windings, etc., shall be of standard dimensions built to limit gauges or formed to templates, such that parts will be interchangeable between like units, and such that the OWNER may at any time in the future obtain replacement and repair parts for those furnished in the original machine. All parts shall be properly stamped for identification and location in the machine as shown on the assembly drawings in the instruction books furnished.

1.04 REFERENCED STANDARDS

A. Design, manufacture, and assembly of elements of the equipment specified herein shall be in accordance with, but not limited to, published standard of the following, as applicable:
   1. American Bearing Manufacturers Association (ABMA)
   2. American Gear Manufacturers Association (AGMA)

3. American Institute of Steel Construction (AISC)
4. American Iron and Steel Institute (AISI)
5. American National Standards Institute (ANSI)
6. American Petroleum Institute (API)
7. American Society of Mechanical Engineers (ASME)
8. American Society of Testing Materials (ASTM)
9. American Welding Society (AWS)
10. American Water Works Association (AWWA)
11. Hydraulic Institute (HI)
12. Institute of Electrical and Electronics Engineers (IEEE)
13. National Electrical Code (NEC)
14. National Electrical Manufacturers Association (NEMA)
15. Occupational Safety and Health Administration (OSHA)
16. The Society for Protective Coatings (SSPC)
17. Underwriters Laboratories (UL)
18. NSF International

B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALIFICATIONS

A. To assure unity of responsibility, the pump, base, motor, and couplings shall be furnished by the pump manufacturer or his authorized representative. The CONTRACTOR shall assume full responsibility for the satisfactory installation and operation of the entire pumping system including pump, motor, connection to the existing VFD, and controls as specified. The pumps shall be the standard catalogued product of a single pump Manufacturer.

B. The pumps covered by these Specifications shall be standard pumping equipment of proven ability as manufactured by a reputable Manufacturer having long experience in the production of such pumps. The furnished pumps shall be designed, constructed, and installed in accordance with the best practice and methods and shall operate satisfactorily when installed. Pumps shall be manufactured in accordance with the Hydraulic Institute Standards.

C. All equipment furnished under this Specification shall be new and unused and shall be the standard product of manufacturers having a successful record of manufacturing and servicing the equipment and system specified herein for a minimum of five (5) years. The pump manufacturer shall assume unit responsibility for proper operation of pump and motor.

1.06 SUBMITTALS

A. Copies of all materials required to establish compliance with the specifications shall be submitted in accordance with Section 01300. Submittals provided by the MANUFACTURER shall include the following:
   1. Certified shop and erection drawings showing all important details of construction, dimensions, and anchor bolt locations.
   2. Descriptive literature, bulletins, and/or catalogs of the equipment.

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3. Data on the characteristics and performance of each pump. Data shall include guaranteed performance curves, based on actual shop tests of similar units, which show that they meet the specified requirements for head, capacity, efficiency, NPSHr, and horsepower. Curves shall be submitted on 8-1/2 inch by 11-inch sheets, at as large a scale as is practical. Curves shall be plotted from no flow at shut off head to runout pump capacity at minimum specified total head. Catalog sheets showing a family of curves will not be acceptable.
4. Mechanical seal and flush piping arrangement diagram, demonstrating conformance with these specifications.
5. Complete master wiring diagrams, elementary or control schematics, including coordination with other electrical control devices such as the pump control system and suitable outline drawings shall be furnished. Provide suitable outline drawings showing such details as are necessary to locate conduit stub-ups and field wiring. Due to the complexity of the system, it is imperative the above drawings be clear and carefully prepared to facilitate interconnections with other equipment. Standard pre-printed sheets or drawings simply marked to indicate applicability to this Contract will be acceptable. Refer to the Drawings for the control wiring diagrams for the pump motors.
6. The total weight of the equipment, including the weight of the single largest item.
7. A complete total bill of materials of all equipment.
8. A list of the MANUFACTURER'S recommended spare parts to be supplied in addition to those specified in Paragraph 1.08, with the MANUFACTURER'S current price for each item. Include gaskets, packing, etc. on the list.
9. Complete motor data in accordance with Section 16150: Electric Motors.
10. Maximum reverse runaway speed calculation.
11. Written documentation provided by the manufacturer warranting the pump at the minimum flow condition as per Paragraph 2.02 B.

B. Certification from the pump Manufacturer that pump and all wetted parts comply with NSF 61 and are compatible with chlorine concentrations specified. Additionally, provide certification that the wetted parts contain a weighted average lead content of less than 0.25%.

C. MANUFACTURER shall provide factory performance test data, including pump performance curves, showing head-capacity relationship, brake horsepower, efficiency, NPSH requirements, and pump speed. Historical certified data from other pumps with the exact model and exact impeller diameter is acceptable in lieu of the factory NPSHr test. The curves shall be complete for the entire range of operation from shutoff head to pump curve runout with the supplied motor. Provide actual test speed curves at 10% increments from 50% to 100% speed.

D. MANUFACTURER shall provide operation and maintenance data in accordance with Section 01730, and Paragraph 1.07.

E. CONTRACTOR shall conduct field testing under the direction of the MANUFACTURER. MANUFACTURER shall provide field test results for inspection and testing for vibration and performance in accordance with requirements of Paragraph 3.05 and Section 01465.

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F. CONTRACTOR shall conduct leveling and alignment; final alignment shall be conducted under the direction of the MANUFACTURER. MANUFACTURER shall provide an alignment test report.

G. MANUFACTURER and CONTRACTOR shall provide certified agreements to the conditions of warranty. Warranty conditions shall comply with requirements listed in Paragraph 1.10.

H. In the event it is impossible to conform to certain details of the specifications due to different manufacturing techniques, describe completely all non-conforming aspects. Failure to describe any and all deviations from the Specifications will be a cause for rejection.

1.07 OPERATING INSTRUCTIONS

A. Operating and maintenance manuals shall be furnished by the MANUFACTURER. The manuals shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, descriptions, etc. that are required to instruct operation and maintenance personnel unfamiliar with such equipment. The number and special requirements shall be as specified in Section 01730.

1.08 TOOLS AND SPARE PARTS

A. The MANUFACTURER of the equipment specified herein shall furnish a complete list of recommended spare parts necessary for the first five years of operation of the pumping system. Spare parts to be furnished, if any, are listed in the respective paragraphs of PART 2 PRODUCTS.

1.09 PRODUCT HANDLING

A. All parts shall be properly protected so that no damage or deterioration will occur from the time of shipment until installation is completed and the units and equipment are ready for operational.

B. All equipment and parts must be properly protected against any damage during a storage period at the site.

C. Factory assembled parts and components shall not be dismantled for shipment unless permission is received in writing from the ENGINEER.

D. Finished surfaces of all exposed pump openings shall be protected by wooden blanks, strongly built and securely bolted thereto.

E. Finished iron or steel not painted or electro-polished shall be properly protected to prevent rust and corrosion.

F. After hydrostatic or other tests, all entrapped water shall be drained prior to shipment, and proper care shall be taken to protect parts from the entrance of water during shipment, storage and handling.

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G. Each box or package shall be properly marked to show its net weight in addition to its contents.

1.10 WARRANTY

A. All equipment supplied under this section shall be warranted for a period of one (1) year by the MANUFACTURER from the date of substantial completion. Warranty period shall commence as outlined in the General Conditions.

B. The equipment shall be warranted to be free from defects in workmanship, design and materials. If any part of the equipment should fail during the warranty period, it shall be replaced in the machine(s) and the unit(s) restored to service at no expense to the OWNER.

C. The MANUFACTURER shall warrant performance of the pump pursuant to their approval of the CONTRACTOR's installation. CONTRACTOR shall warrant the overall installation against any installation defects.

PART 2 – PRODUCTS

2.01 MATERIAL AND EQUIPMENT

A. The pumping unit required under this section shall be complete, including pump and motor, with proper alignment and balancing. All parts shall be so designed and proportioned as to have liberal strength, stability, and stiffness and to be especially adapted for the work to be done. Ample room shall be provided for inspection, repairs, and adjustment.

B. The base plate for the pump and drive shall be rigidly and accurately anchored into position. All necessary foundation bolts, wedge anchors, plates, nuts, and washers shall be 316 stainless steel and shall be furnished by the CONTRACTOR in accordance with MANUFACTURER'S recommendations. Level and grout the base plate with non-shrink, epoxy grout in accordance with the MANUFACTURER'S instructions. The CONTRACTOR shall submit proposed epoxy grout mix to ENGINEER for approval. Grouting shall occur after field alignment and prior to vibration testing.

C. A stainless-steel name plate giving the name of the MANUFACTURER, the rated capacity, head, speed, and all other pertinent data shall be attached to the pump. A similar name plate for motor characteristics shall be attached to the motor.

D. The pumping unit and its driving equipment shall be designed and constructed to withstand the maximum run-away speed of the units due to back flow through the pump.

E. The pump furnished hereunder must fully comply with the requirements of ANSI/AWWA E-103-7, Horizontal and Vertical Line Shaft Pumps.

F. Pump and motor baseplate shall be provided with a standard NEMA 2-hole ground lug attachment on the pump end for auxiliary connection to station ground grid.

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2.02 PUMP

A. General
1. The pump shall be of the horizontal, centrifugal, split case, double suction, single or double volute type designed to pump potable water with chlorine concentrations of up to 4 mg/L.
2. The pump shall be of standard dimensions, built to limit gauges or formed to templates, such that parts will be interchangeable between like units.
3. The pump shall be manufactured by ENGINEER approved pump manufacturer as listed in Tables 11200-1, 11200-2 and 11200-3.

B. Performance Requirements
1. When operating at the maximum output speed of the motor, each pump shall have a characteristic performance curve which meets all the minimum conditions listed in Table 11200-1, 11200-2, and 11200-3. The pump and drive motor shall be capable of operating satisfactorily under the full range of conditions as defined, the figures at the end of this Section, and as described herein. The manufacturer shall provide written documentation warranting the pump to routinely operate at the minimum and maximum flow as well as warrant that the pump will operate within Hydraulic Institute (HI) standards for vibration at these conditions as demonstrated by factory acceptance testing.
2. There shall be no significant change in vibration and noise level within the entire normal range of operation as identified in graphical figure below. HI limits for acceptable vibration shall not be exceeded for normal operation points outside the HI defined POR, which manufacturer has warranted for satisfactory operation.
3. Provide motor size as listed in Table 11200-1. Manufacturer shall certify that motor shall be non-overloading over the entire operating range identified, with actual pump and motor provided.
4. Certified Factory Test
   a. MANUFACTURER shall record any testing performed on the pump in the factory. MANUFACTURER is not permitted to trim the impeller more than what was in the approved shop drawings submittal without written approval from the ENGINEER and OWNER.
   b. Certified factory performance testing shall be performed by the pump manufacturer for the high service pump in accordance with the standards of the Hydraulic Institute. The tests shall be witnessed by a test lab manager employed by the MANUFACTURER. The test data and performance curves shall be signed by the test lab manager who witnessed the test. A shop motor may be utilized for all factory testing to confirm pump performance. Pump shall not be shipped until tests have been submitted and approved by the ENGINEER.
      i. Hydraulic and electrical performance tests shall measure capacity, head, power, current, speed, and voltage at a minimum of six evenly spaced points for each speed. Test points shall include shut-off head and a maximum flow of at least 125% of the flow at best efficiency point (BEP) while operated on a VFD at 10% speed increments from

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50% to 100% speed. The remaining points shall be evenly spaced along the curve. This array will result in 36 data points for each pump. Proposed testing method and points shall be submitted to ENGINEER for approval during shop drawing review and prior to testing.

ii. An NPSH test shall be performed on one pump for each pump model under this specification to substantiate the maximum NPSHr for the pump at the flow rate listed in Table 11200-1, unless historical values of the same model and impeller trim are submitted in lieu of actual test data.

iii. Provide vibration readings in X, Y, and Z axes at every test point recording (the 36 points identified above) and identify the BEP and manufacturers minimum recommend flow rate (minimum continuous stable flow, MCSF) at every given speed. If requested by the MANUFACTURER and approved by the ENGINEER, the number of test points may be reduced, but, at a minimum, the vibration recordings shall be taken at points of flow and head as follows: 1 recording at the lower bound of the allowable operating region (AOR), 1 recording at the lower bound of the preferred operating region (POR), 1 recording at the BEP, 1 recording at the higher bound of the POR, and 1 recording at the higher bound of the AOR, for each speed tested. Manufacturer shall identify the AOR within testing submittal.

b. All electronic transducers, meters, gauges, and other test instruments shall be calibrated within the required calibration periods as defined by the Hydraulic Institute and the MANUFACTURER'S quality control program. Differential pressure type flow meters, such as venturis shall have been calibrated within 5 years. Mechanical variation of the meter throat diameter will be accepted as verification of calibration validity.

c. The pump shall be tested through the specified range of flow, and head/capacity/efficiency curves plotted at maximum output speed. During each test, the pump shall be run at each head condition for sufficient time to accurately determine discharge, head, power input, and efficiency. If the pump fails to meet any specification requirement, MANUFACTURER shall provide testing data for review by the ENGINEER prior to modifying the pump. Fine polishing or application of coatings to the impeller shall not be performed without the written authorization of the ENGINEER.

d. In accordance with Paragraph 1.06, certified pump performance curves shall be submitted. Submittal shall include pump curves, and tabulated head, capacity, brake horsepower, and pump efficiency for each pump supplied.

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C. Pump Construction
   1. Pump Casing
      a. The pump case shall be of cast iron construction ASTM A-48, Class 30 or 35, having a minimum tensile strength of not less than 30,000 pounds per square inch.
      b. Casings shall be free from blow holes, sand pockets or other imperfections.
      c. The interior and exterior surfaces of the casings shall be smooth with matching flanges. The interior waterways of the pump casings shall be coated with a NSF 61 approved epoxy coating to improve long term efficiency.
      d. The horizontal casing joint shall be a machined fit, with manufacturer's standard gasket. The case joints shall be made up with stainless steel stud bolts screwed into the lower casing flange or bolts and nuts. Joints shall be fitted with hardened stainless-steel jacking screws or hex head cap screws.
      e. Suction and discharge flanges shall be faced and drilled ANSI Class 125 Standard. There shall be ¼-inch NPT tapped holes in both the suction and discharge flanges of the pump for test gauge connections.
      f. All holes for flange bolts, studs and cap screws in the casing shall be spot faced. The top half of each case at the topmost part shall have a bossed pipe tap opening not less than ½-inch NPT.
      g. The casing at both suction inlets to the impellers shall be protected with stainless steel renewable wearing rings. The wearing rings shall be of one-piece construction, held rigidly in slots in the case, and shall be Nitronic 60 ASTM A743 Grade CF10SMnN or 400 Series stainless steel.
   2. Impeller
      a. Impellers shall be constructed of ASTM C95800 nickel aluminum bronze or 316 stainless steel enclosed double suction type of one-piece construction. Impeller shall be machined outside and smoothly finished on the internal water passages and shall be balanced.
      b. Impellers shall be protected from wear at both suction inlets with renewable ASTM A743 CF8M, 316 stainless steel wearing rings. These rings shall be fastened to the impeller such that they cannot loosen in service.
      c. Impellers shall not have any coating applied.
   3. Bearings
      a. The weight of the pump shaft and impeller assembly shall be carried on anti-friction bearings at each end of the pump shaft. Bearings shall be grease lubricated, double row inboard/outboard, deep groove ball type antifriction bearings designed for an ABMA L 10 average life of 130,000 hours for any point within the pump operating conditions specified.
   4. Shafts
      a. Pump shafts shall be of ASTM A582, 416 SS, ground and polished over the entire length.
      b. Impeller nuts or threaded sleeves shall be made of 316 SS.
   5. Mechanical Seals
      a. The pump shall be equipped with cartridge type mechanical seals as manufactured by pump MANUFACTURER, by Chesterton, John Crane JC21 Elastomer Bellows, or JC5610/5611 cartridge seals. Seal materials

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of construction shall be 316 SS, stationary face is to be carbon, rotating face reaction bonded silicon carbide or tungsten carbide, and the springs are to be Hastelloy and to be isolated from the process. The elastomers shall be EPDM.

b. Seal glands shall be 316SS and have two flush ports drilled and tapped 180 degrees apart.

c. Pump seals shall be furnished with external seal flush piping to be connected to the volute (API Plan 11). The tubing, fittings and valves shall be 316SS and furnished and installed by the MANUFACTURER. Flush piping may be removed for shipping and installed by the CONTRACTOR at the option of the manufacturer. The piping shall include a blow off connection at the high point piped to a seal drain to allow air venting of the volute and piping.

6. Flexible Shaft Coupling

a. Each unit shall be provided with a grid type flexible coupling providing a minimum actual service factor rating of 2.0 as manufactured by T.B. Wood's ("Sure-Flex"), Falk ("Steelflex") or other OWNER approved coupling.

b. Couplings for connection to driver shafts shall be of the limited end float type.

c. Coupling pins or bolts and coupling rubber bushings for the flexible couplings on the pump shall be interchangeable between the several couplings.

d. Each flexible coupling shall be provided with a removable aluminum or stainless-steel coupling guard, not less than 18 gauge. Coupling guards shall meet the applicable requirements of OSHA and the Florida Industrial Safety Laws.

7. Pumping Unit Support Baseplate

a. Each pumping unit shall be mounted on a continuous fabricated steel baseplate. Baseplate shall be of the box type construction with internal web reinforcing for rigidity and with a moisture collecting drip rim. The baseplates shall be constructed of bent steel plates with rounded corners and all welded joints ground smooth. Standard structural shapes shall not be used for any external surfaces. Baseplates shall be designed so as not to exceed the dimensions of the concrete bases shown on the Drawings.

b. The drip rim shall collect condensation moisture from the pump. The drip rim shall extend on both sides of the baseplate from the drive end to the pump end and across the pump end with a slope not less than 1/8-inch per foot. The depth of the drip rim shall be not less than 3/4 inches. At the lowest point of the drip rim on the pump end there shall be a 3/4-inch pipe tap for drainage piping. A single drain connection shall be provided. Multiple drain connections are prohibited. The CONTRACTOR shall furnish and install drain piping from each baseplate to the trench drain.

c. Baseplates shall be of such design and have sufficient grout holes that they can be filled with grout after the units are leveled and aligned.

d. All items of equipment shall be mounted on heavy mounting pads, and all mounting pads shall have machined surfaces. All square edges and corners of these mounting pads shall have the sharp edges "knocked off" by grinding. All parts of the baseplates which are flame cut and exposed

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to view shall be ground relatively smooth to remove at least 90 percent of the flame cutting marks.

e. The equipment shall be held to the mounting pads with cap screws; through bolts will not be considered. If shims are required under the mounting feet of equipment for alignment and leveling purposes, they shall be full faced cut to the contour of the equipment feet.

f. Each baseplate shall be supplied with sufficient anchor bolts for holding the baseplates in position while installing, leveling, aligning and grouting the units. Anchor bolts shall be sufficiently strong for all stresses which will be imposed on them during the operation of the units. Anchor bolts shall be provided with steel pipe sleeves and heavy semi-finished hex nuts and shall be supplied by the CONTRACTOR.

g. All studs and alignment pins, if necessary, shall be 316SS or 17-4PH SS.

2.03 ELECTRIC MOTOR

A. General

1. Motor shall be ODP and shall conform to all requirements stipulated in Section 16150: Electric Motors. Pump motors shall be inverter duty rated.
2. The pump motor shall be of the horizontal squirrel cage induction type.
3. Motor must be designed to accept all loads imposed by pump during starting and running.
4. All motors shall be built in accordance with latest NEMA, IEEE, ANSI, and ABMA standards where applicable.
5. Motor shall be furnished by the pump MANUFACTURER.
6. Each motor shall be provided with winding temperature detectors in accordance with Section 16150: Electric Motors.

PART 3 – EXECUTION

3.01 INSTALLATION

A. The CONTRACTOR shall install the equipment in strict accordance with the MANUFACTURER'S instructions and recommendations in the locations shown on the Drawings. Installation shall include furnishing the required oil and grease for initial operation. The grades of oil and grease shall be in accordance with the MANUFACTURER'S recommendations. Anchor bolts shall be set in accordance with the MANUFACTURER'S recommendations.

B. MANUFACTURER shall provide the CONTRACTOR with a certificate stating that the installation of the equipment is satisfactory, that the equipment is ready for operation, and that the operating personnel have been suitably instructed in the operation, lubrication, and care of each unit per Section 01730.

3.02 ALIGNMENT CRITERIA

A. CONTRACTOR shall install and level the pump. MANUFACTURER shall oversee final equipment leveling and alignment per the below criteria. MANUFACTURER shall submit an alignment report to be approved by ENGINEER prior to grouting the

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baseplate or testing the pump. CONTRCTOR shall grout baseplate after final leveling and alignment and prior to startup and vibration testing.

B. All rotating machinery (drivers, transmission devices and driven equipment) shall be installed using the following guidelines for final machinery setup.

C. Equipment shall be aligned using a certified laser alignment system. This system shall meet or exceed the capabilities of the OPTALIGN or OPTALIGN plus, which may include the ROTALIGN, ROTALIGN Pro or ROTALIGN Ultra. This system must be able to print out the final alignment readings to be given to SJCUD.

D. Prior to the installation of rotating machines, the concrete pump pedestal shall be checked for level to ensure there is no more than a 0.001-inch slope per foot across the pedestal. These measurements shall be taken in two directions across the pedestal (i.e. the pedestal shall not slope more than 0.001-inch per foot in any direction) and shall be submitted to and approved by the ENGINEER prior to the installation of the pump.

E. Prior to the installation of rotating machines and alignment of coupling, the sole plates, skid pads, or base plates shall be checked for level to ensure there is no more than a 0.001-inch slope per foot. These measurements shall be taken in two directions across the support (i.e. the support shall not slope more than 0.001-inch per foot in any direction) and shall be submitted to the ENGINEER with the alignment test report. If level cannot be achieved as specified, the MANUFACTURER shall immediately notify the ENGINEER prior to proceeding with alignment. For continuous sole plates, skid pads, or base plates extending across two or more machine hold down feet, a maximum of 0.001-inch per foot or a total of 0.005-inch will be accepted.

F. The equipment shall be installed on the pad and a final leveling performed prior to any piping or ductwork connections being made. All equipment will be installed and leveled with 0.002-inch shims, not to exceed 5 shims, with no one shim-location totaling more than 0.010-inch, under each foot to accommodate future alignment changes. (The shims are to be stainless steel, “Full Foot” machine shims, preferably Precision brand, due to testing has shown other manufacturer shims to have cupping causing induced soft foot of equipment). Soft foot measurements before pipe connection shall not exceed 0.002-inch on each machine foot.

G. After pipe connections, pipe strain shall be less than 0.003-inch deflection on equipment (as demonstrated by pipe strain gauge) and shall not cause any soft foot reading to be greater than 0.002-inch. Additional shimming is acceptable ONLY if approved by the ENGINEER and maximum pipe strain criteria is demonstrated. Machine feet to base gaps shall be field verified with both feeler gauges and dial indicators and no machine foot shall have more than 0.002-inch soft foot when the foot bolts are tightened.

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H. A run-out check of the couplings and shafts shall indicate no more than 0.002-inch run-out on machines with a running speed of 1800 rpm or less or no more than 0.001-inch of run-out on machines with a running speed of greater than 1800 rpm.

I. The final alignment across the coupling shall not exceed the following tolerance (based on a 10-inch diameter coupling, these values are true centerline to centerline shaft deviations, i.e. they are 1/2 T.I.R. (total indicated run-out)):

Running Speed (rpm)	Parallel Offset (inches)	Angular Offset/(GAP) (inches/10-inch dia)
≤ 600	0.003	0.006
1200	0.0025	0.005
1800	0.002	0.003
3600	0.001	0.002
7200	0.0005	0.001

For couplings with a diameter greater than 10-inch, the values for angular offset shall be calculated on a per inch basis matching the above basis. For couplings with a diameter of 10-inch or less, the above numbers shall be used as absolute values.

3.03 SHOP PAINTING

A. Before exposure to weather and prior to shop painting all surfaces shall be thoroughly cleaned, dry and free from all mill-scale, rust grease, dirt, and other foreign matter.

B. Pump, including base plate, shall be shop primed with primer compatible with shop painting as specified in Section 09900.

C. All nameplates shall be properly protected during painting.

D. Gears, bearing surfaces, and other similar surfaces obviously not to be painted shall be given a heavy shop coat of grease or other suitable rust resistant coating. This coating shall be maintained as necessary to prevent corrosion during periods of storage and erection and shall be satisfactory to the ENGINEER up to the time of the final acceptance test.

3.04 FIELD PAINTING

A. Field painting of the pump shall be by the CONTRACTOR. The pump including base plates, shall be factory primed with a coating compatible with field applied coatings and as specified in Section 09900. SJCUD shall select the finish color from color charts submitted by the CONTRACTOR. All intermediate and finish coats shall be field applied by the CONTRACTOR in accordance with Section 09900.

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3.05 FIELD INSPECTION AND TESTING

A. General

1. The number of visits and testing described herein are outlined as the minimum requirements for completion of work. CONTRACTOR shall ensure system is ready prior to scheduling site visits by MANUFACTURER. Any cost for additional field visits by the MANUFACTURER shall be borne by the CONTRACTOR.
2. The equipment MANUFACTURER shall furnish the services of a competent and experienced field technician who has complete knowledge of the proper installation, operation, and maintenance of the equipment to inspect the installed equipment and supervise the initial test run performed by the CONTRACTOR.
   a. The MANUFACTURER shall provide laser alignment of the pump and motor prior to startup as well as a certification that the pump has been installed correctly and have been tested. The CONTRACTOR shall grout the baseplate only after the installation and alignment has been approved. The pump will now be ready for startup and operator training.
   b. The equipment MANUFACTURER's field technician shall be present for startup of the pumping system. Field testing shall be performed by the CONTRACTOR and under the direct supervision of the MANUFACTURER. MANUFACTURER shall record data and provide a startup report.
   c. Above requires a minimum of two (2) 8-hour day trips for the MANUFACTURER exclusive of travel and lodging for the high service pump.
3. The MANUFACTURER'S field technician shall provide training for the OWNER'S operational staff. This can be added to one of the trips for startup. This includes one 8-hour day exclusive of travel and lodging. The final copies of operation and maintenance manuals specified in Section 01300 and 01730 must have been delivered to the ENGINEER prior to scheduling the instruction period with the OWNER.
4. The CONTRACTOR shall be responsible for performing vibration testing under the direct supervision of the MANUFACTURER after satisfactory field alignment and grouting at base of plate. The equipment shall be tested over the entire speed range. The vibration shall be within the limits of ANSI/HI 9.6.4 for field testing and shall be recorded at a minimum of 5 steady state speed and pumping conditions (to be defined by the ENGINEER) as well as under actual variable pressure, flow, and speed pumping conditions. The vibration recordings shall be taken at points of flow and head as follows: 1 recording at the lower bound of the allowable operating region (AOR), 1 recording at the lower bound of the preferred operating region (POR), 1 recording at the BEP, 1 recording at the higher bound of the POR, and 1 recording at the higher bound of the AOR.
5. All field testing shall be witnessed by a SJCUD representative and the ENGINEER. The MANUFACTURER shall submit to the ENGINEER a written notification of all pump field tests a minimum of one week prior to testing. In the event any of the pumping equipment fails to meet the above test requirements, it shall be modified and retested in accordance with the requirements of these Specifications. The MANUFACTURER shall then certify

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in writing that the equipment has been satisfactorily tested, and that all final adjustments have been made. Certification shall include date of final acceptance test, as well as a listing of all persons present during tests, and resulting test data.

B. Pump

1. After the pump has been completely installed and working to the satisfaction of the pump MANUFACTURER, the CONTRACTOR shall conduct in the presence of the ENGINEER and pump supplier representative such tests as are necessary to indicate that the pumping system operates satisfactorily and generally meets the conditions of service specified. The pump manufacturer shall record pumping operating data at full speed and at reduced speeds. The data shall be plotted and provided to the ENGINEER for review and approval. The field test shall demonstrate correct mechanical operation after pump startup. Field tests shall include the pump included under this Section. MANUFACTURER shall supply all labor, equipment and incidentals required to guide the CONTRACTOR to complete the field tests and to record all data.

C. Motors

1. The CONTRACTOR shall megger the motor winding in accordance with MANUFACTURER'S instructions upon delivery and before energizing the motor, and, if insulation resistance is found to be low, shall notify the ENGINEER and shall not energize the motor.
2. The CONTRACTOR shall check the motor for correct clearances and alignment and for correct lubrication in accordance with MANUFACTURER'S instructions. The CONTRACTOR shall check direction of rotation of the motor and reverse connections if necessary.

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TABLE 11200-1: PUMP DESIGN REQUIREMENTS (HSPs)

Item/Description	Value
Pump Name	**High Service Pump**
Pump Tags	**P-520,P-530,P-540**
Number of Pump(s) (duty/standby)	3 (2/1); 1 relocated
Maximum motor synchronous speed (rpm)	3,600
Pump Acceptance Grade[1]	1E
Maximum motor size to be supplied[2] (hp/voltage)	30 / 460
Pump Fluid Temperature (assumed)	60 degrees F
Pumped Fluid	Potable Water
Minimum suction size (inches)	5
Minimum discharge size (inches)	4
Minimum pump shut-off head at design speed (feet)	155
Primary design and acceptance point (flow in gpm/TDH in feet)[1]	(500 / 145)
Minimum pump overall hydraulic efficiency at primary design point (%)	73.4
Maximum NPSH required at 500 gpm (feet)	10.97
Engineer approved pump manufacturer (model)	Xylem 10BF1Q9T3-T

[1]A motor and pump assembly conforming to Hydraulic Institute Acceptance Grade 1E with efficiency as the guaranteed requirement (with the exception that negative values will not be permitted) at the primary design point and the acceptance point identified on the attached curves shall be provided.
[2]Sufficient motor horsepower shall be provided by the manufacturer to prevent motor overload exceeding 100% of rated motor horsepower at the acceptance point identified on the attached curves. Should pump fail this criteria at time of factory testing, the manufacturer shall provide a larger motor at the manufacturer's sole expense.

TABLE 11200-2: PUMP DESIGN REQUIREMENTS (RO FEED PUMPS)

Item/Description	Value
Pump Name	**RO Feed Pump**
Pump Tags	**P-010,P-020, P-030**
Number of Pump(s) (duty/standby)	3 (2/1)
Maximum motor synchronous speed (rpm)	1,800
Pump Acceptance Grade[1]	1E
Maximum motor size to be supplied[2] (hp/voltage)	15 / 460
Pump Fluid Temperature (assumed)	60 degrees F
Pumped Fluid	Potable Water
Minimum suction size (inches)	4
Minimum discharge size (inches)	3
Minimum pump shut-off head at design speed (feet)	104
Primary design and acceptance point (flow in gpm/TDH in feet)[1]	(500 / 70)
Minimum pump overall hydraulic efficiency at primary design point (%)	74.4
Maximum NPSH required at 500 gpm (feet)	11.46
Engineer approved pump manufacturer (model)	Xylem 12BF2M9B0

[1]A motor and pump assembly conforming to Hydraulic Institute Acceptance Grade 1E with efficiency as the guaranteed requirement (with the exception that negative values will not be permitted) at the primary design point and the acceptance point identified on the attached curves shall be provided.
[2]Sufficient motor horsepower shall be provided by the manufacturer to prevent motor overload exceeding 100% of rated motor horsepower at the acceptance point identified on the attached curves. Should pump fail this criteria at time of factory testing, the manufacturer shall provide a larger motor at the manufacturer's sole expense.

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TABLE 11200-3: PUMP DESIGN REQUIREMENTS (BID ALTERNATE: GST FEED PUMPS)

Item/Description	Value
Pump Name	**GST Feed Pump**
Pump Tags	**P-401, P-402**
Number of Pump(s) (duty/standby)	2 (1/1)
Maximum motor synchronous speed (rpm)	1,200
Pump Acceptance Grade[1]	1E
Maximum motor size to be supplied[2] (hp/voltage)	15 / 460
Pump Fluid Temperature (assumed)	60 degrees F
Pumped Fluid	Potable Water
Minimum suction size (inches)	8
Minimum discharge size (inches)	6
Minimum pump shut-off head at design speed (feet)	47
Primary design and acceptance point (flow in gpm/TDH in feet)[1]	(1,050 / 30)
Average daily flow point (gpm/TDH in feet)	(868 / 20)
Minimum pump overall hydraulic efficiency at primary design point (%)	73.1
Maximum NPSH required at 500 gpm (feet)	3.98
Engineer approved pump manufacturer (model)	Xylem 18BF3M9H0

[1]A motor and pump assembly conforming to Hydraulic Institute Acceptance Grade 1E with efficiency as the guaranteed requirement (with the exception that negative values will not be permitted) at the primary design point and the acceptance point identified on the attached curves shall be provided.

[2]Sufficient motor horsepower shall be provided by the manufacturer to prevent motor overload exceeding 100% of rated motor horsepower at the acceptance point identified on the attached curves. Should pump fail this criteria at time of factory testing, the manufacturer shall provide a larger motor at the manufacturer's sole expense.

END OF SECTION 11200

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SECTION 11210

REVERSE OSMOSIS SKID SYSTEM

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. Furnish, test, and put into operation two (2) 50% reverse osmosis skids, one (1) reverse osmosis CIP skid, and one (1) anti-scalant metering pump system. The skid and pump system design equipment shall be sized per Table 11210-1.

B. The skid MANUFACTURER shall include, but not limited to, the following responsibilities in their scope of work:
   1. Shop drawing submittals to the OWNER per this Section and Section 01300
   2. Factory acceptance testing and submittal
   3. Coordination with the installing CONTRACTOR for any activities to deliver, install, and test the pump
   4. Provide anchoring and grouting recommendations to the CONTRACTOR
   5. Verification of system installation (installation by CONTRACTOR)
   6. Review of final alignment of skid equipment (alignment by CONTRACTOR) and alignment report submittal
   7. Development of operation and maintenance information and manual submittals per Section 01730
   8. Observe and record data from functional demonstration, vibration, and performance testing; CONTRACTOR shall conduct testing, but MANUFACTURER shall provide a report of field testing performed by the CONTRACTOR.
   9. MANUFACTURER shall provide an authorized representative who has complete knowledge of the proper installation, operation, and maintenance of the equipment for required site visits detailed in this Section

C. The CONTRACTOR shall include, but not limited to, the following responsibilities in their scope of work:
   1. Coordination with the skid MANUFACTURER as required to provide fully operational equipment
   2. Equipment unloading, storage, and installation per the MANUFACTURER's recommendations
   3. Perform leveling and alignment with the support of the MANUFACTURER
   4. Repair any defects incurred during unloading, storage, and installation of the skids
   5. Coordinate with MANUFACTURER for an installation inspection and address any issues identified during the review
   6. Conduct field functional demonstration, vibration, and performance testing with support of the MANUFACTURER
   7. Overall commissioning of the installation

D. The units shall be furnished with all necessary accessory equipment including, but not limited to, reverse osmosis skids, stainless cartridge filter with 5-micron cartridge filters, stainless steel first pass high pressure pump, FRP pressure vessels, membranes, flow meters, conductivity meters, pressure transmitters, piping, instruments and valves; anti-scalant metering system with three (3) 100% 3 gph at 100 psi chemical metering pumps for each skid, two (2) calibration columns for each skid, two (2) discharge backpressure valves for each skid; CIP tank system with 800-

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gallon PE CIP tank, stainless steel CIP pump, cartridge filter housing with polyethene 5-micron cartridges, painted carbon steel skid, spare parts, special tools and any other required ancillary components, whether specifically mentioned in this Section or not, as required for a complete operational system incorporating the highest standards for this type of service including field testing and instructing the regular operating personnel in the care, operation, and maintenance of all equipment. All complete equipment units shall be factory assembled and tested and shall be shipped in as large an assembly as practical to minimize field assembling effort.

1.02 RELATED WORK

A. Division 16 for electrical and instrumentation requirements.

1.03 DESCRIPTION OF SYSTEM

A. Two (2) new 50% reverse osmosis skids, one (1) anti-scalant metering pump system, and one (1) reverse osmosis CIP system are required under this CONTRACT. The required equipment shall be located and arranged as shown on the Drawings.

B. The reverse osmosis units operate continuously and are monitored by the instruments and PLC. The PLC will alarm on non-critical conditions such as poor quality or shut down the RO system on critical conditions such as low suction pressure or high discharge pressure. All alarm and shut down conditions are indicated on the control interface. Dry contact inputs are provided for chemical tank low level, pretreatment interlock, tank level, plus feed and pump discharge pressure switched. The pretreatment interlock or tank high input will put the RO into “standby” mode. During the standby mode, the RO will periodically flush with feed water (the high-pressure pump is not running) to maintain optimal system performance.

C. All components of the RO system that come into contact with water shall be NSF 61 approved and certified. The skid manufacturer shall provide certification during the shop drawing process.

D. All working parts of the new system including all pump and motor, such as bearings, wearing rings, shaft sleeves, motor windings, etc., shall be of standard dimensions built to limit gauges or formed to templates, such that parts will be interchangeable between like units, and such that the OWNER may at any time in the future obtain replacement and repair parts for those furnished in the original machine. All parts shall be properly stamped for identification and location in the machine as shown on the assembly drawings in the instruction books furnished.

1.04 REFERENCED STANDARDS

A. Design, manufacture, and assembly of elements of the equipment specified herein shall be in accordance with, but not limited to, published standard of the following, as applicable:
   1. American Bearing Manufacturers Association (ABMA)
   2. American Gear Manufacturers Association (AGMA)
   3. American Institute of Steel Construction (AISC)
   4. American Iron and Steel Institute (AISI)

5. American National Standards Institute (ANSI)
6. American Petroleum Institute (API)
7. American Society of Mechanical Engineers (ASME)
8. American Society of Testing Materials (ASTM)
9. American Welding Society (AWS)
10. American Water Works Association (AWWA)
11. Hydraulic Institute (HI)
12. Institute of Electrical and Electronics Engineers (IEEE)
13. National Electrical Code (NEC)
14. National Electrical Manufacturers Association (NEMA)
15. Occupational Safety and Health Administration (OSHA)
16. The Society for Protective Coatings (SSPC)
17. Underwriters Laboratories (UL)
18. NSF International

B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALIFICATIONS

A. To assure unity of responsibility, the reverse osmosis units shall be furnished by the manufacturer or his authorized representative. The CONTRACTOR shall assume full responsibility for the satisfactory installation and operation of the entire reverse osmosis system. The basis of design for the RO system is that it is manufactured by Evoqua. The OWNER may accept an ENGINEER approved equal as long as it meets the same standard qualifications and criteria listed below. If an alternative is approved and accepted, all equipment shall be furnished by a single Manufacturer with single-source responsibility.

B. The pump covered by these Specifications shall be standard pumping equipment of proven ability as manufactured by a reputable Manufacturer having long experience in the production of such pumps. The furnished pumps shall be designed, constructed, and installed in accordance with the best practice and methods and shall operate satisfactorily when installed. Pumps shall be manufactured in accordance with the Hydraulic Institute Standards.

C. All equipment furnished under this Specification shall be new and unused and shall be the standard product of manufacturers having a successful record of manufacturing and servicing the equipment and system specified herein for a minimum of five (5) years. The manufacturer shall assume unit responsibility for proper operation of the pre-engineered, pre-assembled reverse osmosis units.

D. Reverse osmosis units will be manufactured by Evoqua or an approved equal to match the existing design criteria listed in Table 11210-1.

1.06 SUBMITTALS

A. Copies of all materials required to establish compliance with the specifications shall be submitted in accordance with Section 01300. Submittals provided by the MANUFACTURER shall include the following:

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1. Certified shop and erection drawings showing all important details of the skid, anti-scalant, and CIP system construction, dimensions, and anchor bolt locations.
2. Descriptive literature, bulletins, and/or catalogs of the equipment.
3. Data on the characteristics and performance of each skid.
4. Mechanical seal and flush piping arrangement diagram, demonstrating conformance with these specifications.
5. Complete master wiring diagrams, elementary or control schematics, including coordination with other electrical control devices and suitable outline drawings shall be furnished. Provide suitable outline drawings showing such details as are necessary to locate conduit stub-ups and field wiring. Due to the complexity of the system, it is imperative the above drawings be clear and carefully prepared to facilitate interconnections with other equipment. Standard pre-printed sheets or drawings simply marked to indicate applicability to this Contract will be acceptable. Refer to the Drawings for the control wiring diagrams.
6. The total weight of the equipment, including the weight of the single largest item.
7. A complete total bill of materials of all equipment.
8. A list of the MANUFACTURER'S recommended spare parts to be supplied in addition to those specified in Paragraph 1.08, with the MANUFACTURER'S current price for each item. Include gaskets, packing, etc. on the list.
9. Complete booster pump motor data in accordance with Section 16150: Electric Motors.
10. Written documentation provided by the manufacturer warranting the skid system as per Paragraph 1.10.

B. MANUFACTURER shall provide factory performance test data, including pump performance curves, showing head-capacity relationship, brake horsepower, efficiency, NPSH requirements, and pump speed. Historical certified data from other pumps with the exact model and exact impeller diameter is acceptable in lieu of the factory NPSHr test.

C. MANUFACTURER shall provide operation and maintenance data in accordance with Section 01730, and Paragraph 1.07.

D. CONTRACTOR shall conduct field testing under the direction of the MANUFACTURER.

E. MANUFACTURER and CONTRACTOR shall provide certified agreements to the conditions of warranty. Warranty conditions shall comply with requirements listed in Paragraph 1.10.

F. In the event it is impossible to conform to certain details of the specifications due to different manufacturing techniques, describe completely all non-conforming aspects. Failure to describe any and all deviations from the Specifications will be a cause for rejection.

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1.07 OPERATING INSTRUCTIONS

A. Operating and maintenance manuals shall be furnished by the MANUFACTURER. The manuals shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, descriptions, etc. that are required to instruct operation and maintenance personnel unfamiliar with such equipment. The number and special requirements shall be as specified in Section 01730.

1.08 TOOLS AND SPARE PARTS

A. The MANUFACTURER of the equipment specified herein shall furnish a complete list of recommended spare parts necessary for the first five years of operation of the skid system. Spare parts to be furnished, if any, are listed in the respective paragraphs of PART 2 PRODUCTS.

1.09 PRODUCT HANDLING

A. All parts shall be properly protected so that no damage or deterioration will occur from the time of shipment until installation is completed and the units and equipment are ready for operational.

B. All equipment and parts must be properly protected against any damage during a storage period at the site.

C. Factory assembled parts and components shall not be dismantled for shipment unless permission is received in writing from the MANUFACTURER.

D. Finished surfaces of all exposed pump openings shall be protected by wooden blanks, strongly built and securely bolted thereto.

E. Finished iron or steel not painted or electro-polished shall be properly protected to prevent rust and corrosion.

F. After hydrostatic or other tests, all entrapped water shall be drained prior to shipment, and proper care shall be taken to protect parts from the entrance of water during shipment, storage and handling.

G. Each box or package shall be properly marked to show its net weight in addition to its contents.

1.10 WARRANTY

A. The RO Skid System Manufacturer shall warrant that the equipment supplied meets these specifications and the performances and that it is new and unused, free from defects in materials and/or workmanship. This warranty shall be for 18 months from equipment delivery to the job site or 12 months from equipment substantial completion, whichever comes first. In the event that it is determined that a defect exists, at the Manufacturer’s discretion, the Manufacturer shall repair or replace the defective components, provided that any such defect was not the result of misuse of the component by the OWNER or his agents.

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PART 2 – PRODUCTS

2.01 RO SKID SYSTEM

A. General
1. The reverse osmosis units are designed for industrial applications.
2. The reverse osmosis units are of horizontal configuration utilizing multistage, vertical pumps.
3. The reverse osmosis units are pre-engineered, pre-assembled units that minimize installation and start-up costs.
4. The reverse osmosis units are fully tested at the factory and require simple utility connections and, with minor set up, adjustment and flushing, are ready for immediate on-line service.
5. Each unit is a single pass reverse osmosis system mounted on an industrial coated structural steel frame.
6. The reverse osmosis unit includes a cartridge filter, high pressure feed pump, FRP side entry pressure vessels, spiral wound thin film composite RO membranes, PVC low pressure feed and reject piping, stainless steel high pressure piping, and PVC product piping.
7. The system shall be controlled by a programmable logic controller (PLC) with a touch screen Human-Machine Interface (HMI). The deluxe and select systems also utilize a Variable Frequency Drive (VFD) and has an integrated Clean in Place (CIP) function.

B. Mechanical
1. The components of the reverse osmosis units are supported by the industrial coated carbon steel frame and designed in such a way to provide easy access for servicing, maintenance, and monitoring system performance. The systems are anchorage rated to the International Building Code (IBC). Medium and low-pressure membranes are available to meet the specific process needs.
2. RO skid models feed, low-pressure reject, and product piping are schedule 80 PVC. The inlet and outlet piping connections to the unit are class 150 PVC flanges. The high-pressure piping is constructed of welded SCH 10 316 stainless steel.
3. A single 316 stainless steel locking valve is used for pump discharge pressure control on the RO units. The unit shall utilize a VFD to maintain a constant product flow. A 316 stainless steel globe valves are used to control the reject flow rate. Sample valves are provided for the RO feed upstream and downstream of the cartridge filter, membrane feed, reject, and combined product water. Grooved cleaning connections are provided at each stage of the RO to clean the membranes.
4. The unit features an integrated cleaning system. The RO cartridge filter and pump are used for CIP along with the factory supplied valves, hoses, and a chemical tank (placed adjacent to the skid). The CIP operation is initiated through the HMI. The units shall feature ORP and pH measurements for protecting the membranes. pH and ORP measurements shall be available options within the model provided.

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C. Electrical
1. The reverse osmosis unit may be supplied with either an Allen-Bradley or a Siemens PLC/HMI based controls package.
2. All units are controlled by a PLC and operated via a color touch panel display (HMI).
3. The Plus model has a motor starter and PLC housed in a single IP 65 enclosure.
4. The Deluxe and Select models have a VFD and PLC housed in an IP 54 enclosure and is equipped with a cooling fan.
5. All systems have Ethernet connectivity for remote control and monitoring purposes.
6. All systems require only a single power drop for operation. These controls monitor and protect the system from damage to itself or nearby equipment systems and/or personnel.

D. Operational
1. The reverse osmosis units operate continuously and are monitored by the instruments and a PLC.
2. The PLC will alarm on non-critical conditions such as poor quality or shut down the RO system on critical conditions such as low suction pressure or high discharge pressure.
3. All alarm and shut down conditions are indicated on the control interface.
4. Dry contact inputs are provided for chemical tank low level, pretreatment interlock, tank level, plus feed and pump discharge pressure switches.
5. The pretreatment interlock or tank high input will put the RO into “Standby” mode. During the standby mode, the RO will periodically flush with feed water (the high-pressure pump is not running) to maintain optimal system performance.

2.02 CLEAN-IN-PLACE (CIP) SYSTEM

A. General
1. CIP Series systems are standard general industrial Clean-In-Place systems for use with Evoqua Water Technologies’ reverse osmosis system or an approved equal.
2. CIP system shall be mounted on a heavy duty aluminum cart for ease of mobility while larger systems are mounted on a polyurethane coated structural steel frame.
3. The CIP systems are pre-assembled, pre-wired, and hydrostatically tested at the factory.

B. Mechanical
1. The CIP Series consists of a cleaning solution tank, recirculation pump and filter housing. These components are supported by a polyurethane coated frame and designed in such a way to provide easy access for servicing, maintenance, and monitoring system performance. The frame is a box or cart type frame configuration designed to offer maximum support and protection for the CIP system’s components.
2. The CIP system’s piping is neatly arranged and supported on the frame. All the valves and piping are schedule 80 PVC. The piping includes a recirculation line that goes back to the tank, which is used to enhance the mixing process of the cleaning chemicals. The tank has a drain valve installed in the bottom to ensure

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a complete drain of the cleaning chemicals. Two inlet connections are provided for the cleaning solution return from the RO system's reject and permeate. Two additional inlet connections are provided allowing for alternate source of water supply. The inlet and outlet piping connections to the unit are class 150 flanges.

3. The storage tank has a removable cover. The overall height of the storage tank is less than 48" allowing for easy addition of cleaning chemicals.
4. Two pressure gauges are provided on the CIP system. One gauge is located between the recirculation pump and the filter housing, indicating pump discharge and filter inlet pressure. The second gauge is located after the filter housing, indicating filter outlet, recirculation and cleaning solution discharge pressure.

C. Electrical
   1. The CIP Series control system is comprised of a control panel and skid mounted wiring. The control panel is an ANSI 61 Grey NEMA 4 enclosure housing electromechanical controls. The control system is integrity and UL tested and certified at the factory prior to shipment. The control panel enclosure also houses a main disconnect switch as well as a step-down transformer to supply 120V-1∅-60Hz to the control components. Electrical service to the CIP unit is a single power drop of 240V or 480V-3∅-60Hz to this enclosure.
   2. The control panel is mounted to the CIP's structural steel frame in such a way to allow easy access to process monitors and control devices such as lights and switches.
   3. Models shall use an in-line rotameter to indicate the cleaning solution flow to the RO unit or use a digital flow monitor mounted in the control panel.

D. Operational
   1. Operation of the cleaning skids are manual.
   2. The operator is required to ensure the solution tank is full and mixed with the proper cleaning chemicals and that all connections between the cleaning skid and the RO system are made.
   3. A pressure switch is mounted on the solution tank to detect low level in the tank and protect the booster pump from cavitation. When the level in the tank falls below the set point (approximately 12-16") the booster pump will shut down.
   4. Optional accessories that shall be included to monitor and shut down the CIP pump as described below.

      pH Monitor: used to monitor the pH of the cleaning solution. A pH Fault light will illuminate when the pH is out of either the high or low limits.

      Low Flow Switch: used to monitor the cleaning solution flow rate. This will shut down the booster pump and illuminate the "Low Flow" light if the flow from the pump falls below the set point.

      3" Hose Kit

PART 3 – EXECUTION

3.01 INSTALLATION

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A. The CONTRACTOR shall install the equipment in strict accordance with the MANUFACTURER'S instructions and recommendations in the locations shown as on the Drawings.

B. MANUFACTURER shall provide the CONTRACTOR with a certificate stating that the installation of the equipment is satisfactory, that the equipment is ready for operation, and that the operating personnel have been suitably instructed in the operation, lubrication, and care of each unit per Section 01730.

3.05 FIELD INSPECTION AND TESTING

A. General

1. The number of visits and testing described herein are outlined as the minimum requirements for completion of work. CONTRACTOR shall ensure system is ready prior to scheduling site visits by MANUFACTURER. Any cost for additional field visits by the MANUFACTURER shall be borne by the CONTRACTOR.

2. The equipment MANUFACTURER shall furnish the services of a competent and experienced field technician who has complete knowledge of the proper installation, operation, and maintenance of the equipment to inspect the installed equipment and supervise the initial test run performed by the CONTRACTOR.
   a. The equipment MANUFACTURER's field technician shall be present for startup of the reverse osmosis system. Field testing shall be performed by the CONTRACTOR and under the direct supervision of the MANUFACTURER. MANUFACTURER shall record data and provide a startup report.
   b. Above requires a minimum of two (2) 8-hour day trips for the MANUFACTURER exclusive of travel and lodging for the reverse osmosis system.
3. On day one of the planned start-up, the assigned MANUFACTURER field technician will conduct a walkdown of the installed equipment and system. Following the walkdown, a conference call will be arranged by the MANUFACTURER Project manager with the OWNER, ENGINEER, and MANUFACTURER field technician. The results of the site walkdown will be reviewed and a decision will be reached as to whether the system installation is complete and accurate or if further installation or corrections are required to allow for start-up to proceed.
4. The MANUFACTURER'S field technician shall provide training for the OWNER'S operational staff. This can be added to one of the trips for startup. This includes one 8-hour day exclusive of travel and lodging. The final copies of operation and maintenance manuals specified in Section 01300 and 01730 must have been delivered to the ENGINEER prior to scheduling the instruction period with the OWNER.
5. All field testing shall be witnessed by a SJCUD representative and the ENGINEER. The MANUFACTURER shall submit to the ENGINEER a written notification of all RO system field tests a minimum of one week prior to testing. In the event any of the pumping equipment fails to meet the above test

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requirements, it shall be modified and retested in accordance with the requirements of these Specifications. The MANUFACTURER shall then certify in writing that the equipment has been satisfactorily tested, and that all final adjustments have been made. Certification shall include date of final acceptance test, as well as a listing of all persons present during tests, and resulting test data.

B. Skid

1. After the skids have been completely installed and working to the satisfaction of the pump MANUFACTURER, the CONTRACTOR shall conduct in the presence of the ENGINEER and skid representative such tests as are necessary to indicate that the skids are operating satisfactorily and generally meets the conditions of service specified. The skid manufacturer shall record pumping operating data at full speed and at reduced speeds. The performance data shall be provided and provided to the ENGINEER for review and approval. The field test shall demonstrate correct mechanical operation after skid startup. Field tests shall include the skid included under this Section. MANUFACTURER shall supply all labor, equipment and incidentals required to guide the CONTRACTOR to complete the field tests and to record all data.

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TABLE 11210-1: SKID EQUIPMENT DESIGN REQUIREMENTS

Item/Description	Value
Reverse Osmosis Units	
Design Parameters	
Number of Reverse Osmosis Skid(s)	2
Nominal Product Flow Rate (permeate/concentrate) GPM	187.5 / 62.5
Configuration	Multi-Stage, 6:4:2 array
Number of Membranes	48
Inlet Pressure	30-60 PSIG
Inlet size	4-inch
Feed Water Temperature	60°F (15.6°C)
Feed Water Source	Well
Outlet size (permeate/concentrate)	4-inch/2-inch
System Recovery (Nominal)	75%
Flux	16 GFD
Product Pressure Available	10 PSIG
Recommended Operating Limits*	
Inlet Pressure	30 - 60 psig
Inlet Temperature	35°F – 90°F
Flux	12-19 GFD
Feed Water Source	Well
System Recovery	70-80%
*Recommended operating limits are established as a guideline. Performance when operating within these parameters varies based on feed water conditions and the selected membrane. Under certain conditions, operation outside of these limits may be possible. A specific RO projection must be run for each individual application to ensure proper performance.	
Parameters Not to Exceed	
Inlet Temperature	35°F Minimum – 112°F Maximum
Turbidity	1 NTU Maximum
Free Chlorine and/or Chloramines	<0.1 PPM Maximum
System Recovery	85% Maximum
Ambient Limitations	
Temperature	35°F Minimum – 95°F Maximum
Humidity	90%, Non-condensing
Location	Protect from sunlight and other UV sources (Indoor installation only)
General Specifications	
Frame	
Materials	304 Stainless Steel
Finish	Bead blast

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TABLE 11210-1: SKID EQUIPMENT DESIGN REQUIREMENTS CONTINUED

Item/Description	Value
Reverse Osmosis Units	
Cartridge Filter Housing	
Materials	304L SS, Passivated
Filter Rating/Material	5-micron Nom. DOE, Polypropylene
Size	22Rx4H (048 unit)
Pump	
Manufacturer	Xylem SSV Vertical Multistage
Capacity (gpm)	250
Horsepower (HP)	60
Materials	316 SS
Motor (Volt/phase/Hz)	480/3/60
Membranes	
Manufacturer	Hydranautics®
Model	CPA5-34
Materials	Polyamide Thin Film Composite (TFC)
Type	Spiral wound
Pressure Vessels	
Model	8” Diameter
Materials	Fiberglass reinforced plastic (FRP)
Rating	450 PSIG
Process Connections	2”, 316L grooved side entry feed/concentrate 1.25” ABS mnpt product connection
Piping Systems	
Feed piping	PVC, Schedule 80
High pressure piping	316L SS, SCH 10
Product piping	PVC, Schedule 80
Cleaning connections	Flanged/Grooved - feed & high pressure

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TABLE 11210-1: SKID EQUIPMENT DESIGN REQUIREMENTS CONTINUED

Item/Description	Value
Reverse Osmosis Units	
General Specifications	
Automatic Process Valves	
Inlet valve	Actuated EPDM lined butterfly valve, fail-to-close
Auto flush valve	Actuated ball valve, 316 SS, fail-to-close
Product Divert Kit	
Product isolation	Actuated EPDM lined butterfly valve, fail-to-close
Product to drain	Actuated EPDM lined butterfly valve, fail-to-open, 100% travel stop to limit open
Product relief valve	100 psig ASME code stamped, carbon steel body with stainless steel trim (normally wetted materials) and Viton soft seat.
Pneumatic speed control	Dual direction control valve with ¼" tube fittings
Hardware	
Fasteners (Bolting)	Stainless Steel
General Specifications	
Pressure	
Indicators	316 SS, 63mm dial, glycerin filled, ¼" NPT
Low feed switch	United Electric 10 series, 316 SS / Buna-N, 120VAC, 4-50 PSIG, 1/4" MNPT
High discharge Switch	United Electric 10 series, 316 SS / Buna-N, 120VAC, 30- 600 PSIG, 1/4" MNPT
Pressure Transmitters	IFM Efector PN2 Series
Quality	
Conductivity monitor	Signet 8900 Series Multi-Parameter
Conductivity sensors	Signet 2850 Series
Flow	
Flow sensors (feed / reject)	Signet 2536
pH and ORP	Standard: Deluxe
Manufacturer	Signet

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TABLE 11210-2: CIP SYSTEM DESIGN REQUIREMENTS

Item/Description	Value
Clean-In-Place Systems	
General Specifications	
Frame	
Materials	Structural carbon steel
Finish	Polyurethane coated, blue Federal Standard 25052
Solution Tank	
Materials	Linear Polyethylene
Rating	Atmospheric
Access	Removable cover
Recirculation Pump	
Manufacturer	Goulds, centrifugal
Materials	Stainless steel
Motor	TEPE or TEFC
Pre-Filter	
Manufacturer	Shelco
Models 150 - 225	316 Stainless steel, 3” 150# ANSI flange
Housing Rating	100 psig non code
Filter Cartridges	5 µ nominal
Piping	
Materials	Schedule 80 PVC
Process Connections	150# ANSI flanges
Valves	
2” and Smaller	George Fischer or equal, PVC body manual ball
3”	Keystone, 222 or equal, cast iron butterfly, EPDM liner, stainless steel disk
Instrumentation Specifications	
Pressure	
Gauges	Ashcroft SL1008 series, 316 stainless steel, 63 mm dial, glycerin filled
Flow	
Model 225	Signet, MK 515 paddle wheel with model 9900 panel display/computer
Low Flow Switch	McDonnell-Miller, 304 stainless steel paddle type

TABLE 11210-2: CIP SYSTEM DESIGN REQUIREMENTS CONTINUED

Item/Description	Value
Clean-In-Place Systems	
Temperature	
Gauge	Ashcroft or equal, 316 stainless steel, 3” dial, 0 – 200°F
Optional Switch	Ashcroft or equal, 316 stainless steel, 75 – 205 °F
Level	
Tank Level Switch	ASCO or equal, pressure switch, 120 VAC
Quality	
Optional pH Monitor	Rosemount 1056, NEMA 4X
Power	240 VAC or 480 VAC / 3 Phase / 60 Hz
Enclosure	Steel enclosure, NEMA 4
Operating Limits	
Temperature	
Maximum Solution Temperature	113 °F
Minimum Solution Temperature	60 °F
Pressure	
Maximum Discharge Pressure	70 psig
Water For Cleaning Solution	
Low pH Solutions	Free of Chlorine and other oxidants Free of suspended solids
High pH Solutions	Free of Chlorine and other oxidants Free of suspended solids Softened RO permeate quality

END OF SECTION 11200

SECTION 11214

VERTICAL TURBINE CAN PUMPS

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. Furnish, test, and put into operation two (2) electric motor-driven, vertical turbine can pumps to serve as ground storage tank (GST) feed pumps for the North Beach Water Treatment Plant. The pumps shall be sized per Table 11214-1.

B. The pump MANUFACTURER shall include, but in no way be limited to, the following responsibilities in their scope of work:
   1. Shop drawing submittals to the OWNER per this Section and Section 01300
   2. Factory acceptance testing and submittal of Certified Pump Curves. Certified Pump Curves shall be submitted to the OWNER and ENGINEER prior to delivery of the pumps to the site. Failure to obtain acceptance of Factory Certified Curves prior to the pump delivery may result of rejection of the equipment
   3. Delivery of the pumps to the project site and coordination with the installing CONTRACTOR for any activities to deliver, install, and test the pump.
   4. Provision of recommendations to the CONTRACTOR for short term storage requirements including any recommendations for maintenance of pumps and motors while in storage
   5. Provision of proper anchoring and grouting requirements to the CONTRACTOR
   6. Verification of system installation (installation by CONTRACTOR)
   7. Review of final alignment of pump (preliminary alignment by CONTRACTOR; MANUFACTURER shall oversee final equipment leveling and alignment per the criteria in this specification) and production of alignment report submittal, Certification of Installation to be provided by the MANUFACTURER
   8. Development of operation and maintenance information and manual submittals per Section 01730
   9. Provision of factory representatives who will observe and record data from functional demonstration, vibration, and performance testing; CONTRACTOR shall conduct testing, but MANUFACTURER shall provide a report of field testing performed by the CONTRACTOR.
   10. MANUFACTURER shall provide an authorized representative who has complete knowledge of the proper installation, operation, and maintenance of the equipment for all required site visits detailed in this Section in addition to any other visits which are required to ensure proper installation and operation, without limitation.

C. The CONTRACTOR shall include, but not limited to, the following responsibilities in their scope of work:
   1. Coordination with the pump MANUFACTURER as required to provide a fully operational system

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2. Equipment unloading, storage, performance of any short-term maintenance advised by the MANUFACTURER while in storage, and installation per the MANUFACTURER's recommendations
3. Performance of leveling and alignment with the support of the MANUFACTURER
4. Repair of any defects incurred during unloading, storage, and installation of the pump
5. Coordination with MANUFACTURER for any installation inspection and address any issues identified during the review
6. Conduct field functional demonstration, vibration, and performance testing with support of the MANUFACTURER
7. Overall commissioning of the installation including the tank, pumps and motors, valves, VFDs, and controls

D. The units shall be furnished with all necessary accessory equipment including, but not limited to, the pumps, motors, base plates, couplings, any specified sensors, spare parts, special tools and any other required ancillary components, whether specifically mentioned in this Section or not, as required for a complete operational system incorporating the highest standards for this type of service including field testing and instructing the regular operating personnel in the care, operation, and maintenance of all equipment. All complete pumping units shall be factory assembled and tested and shall be shipped in as large an assembly as practical to minimize field assembling effort.

1.02 RELATED SECTIONS

A. Section 16150 Electric Motors

1.03 SUBMITTALS

A. Copies of all materials required to establish compliance with the specifications shall be submitted in accordance with Section 01300. Submittals provided by the MANUFACTURER shall include the following:
1. Certified shop and erection drawings showing all important details of construction, dimensions, and anchor bolt locations.
2. Shop drawings shall provide reaction/thrust for the specific model of pump being provided.
3. Descriptive literature, bulletins, and/or catalogs of the equipment.
4. Data on the characteristics and performance of each pump. Data shall include guaranteed performance curves, based on actual shop tests of similar units, which show that they meet the specified requirements for head, capacity, efficiency, NPSHr, current draw, and horsepower. Curves shall be submitted on 8-1/2 inch by 11-inch sheets, at as large a scale as is practical. Curves shall be plotted from no flow at shut off head to runout pump capacity at minimum specified total head. Catalog sheets showing a family of curves will not be acceptable.

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5. Mechanical seal and flush piping arrangement diagram, demonstrating conformance with these specifications.
6. Complete master wiring diagrams, elementary or control schematics, including coordination with other electrical control devices such as the pump control system and suitable outline drawings shall be furnished. Provide suitable outline drawings showing such details as are necessary to locate conduit stub-ups and field wiring. Due to the complexity of the system, it is imperative the above drawings be clear and carefully prepared to facilitate interconnections with other equipment. Standard pre-printed sheets or drawings simply marked to indicate applicability to this Contract will not be acceptable. Refer to the Drawings for the control wiring diagrams for the pump motors.
7. The total weight of the equipment, including the weight of the single largest item.
8. A complete total bill of materials of all equipment.
9. A list of the MANUFACTURER'S recommended spare parts to be supplied in addition to those specified in Paragraph 1.08, with the MANUFACTURER'S current price for each item. Include gaskets, packing, etc. on the list.
10. Complete motor data in accordance with Section 16150: Electric Motors.
11. A statement of compliance with the turbine reverses run-away speed requirements listed in Paragraph 2.01.
12. Certified factory performance test data, including pump performance curves, showing head-capacity relationship, brake horsepower, efficiency, power factor, current draw, and pump speed. The curves shall be complete for the entire range of operation from shutoff to minimum head conditions. Provide actual test speed curves at 10% increments from 50% to 100%. Provide vibration readings in x, y & z axes at every test point and identify BEP and manufacturers minimum recommend flow rate at every given speed. Certified Factory test shall be performed in accordance with requirements of Paragraph 3.04.
13. NPSHr test data for the specific pump model number
14. Operation and Maintenance Data in accordance with Section 01730, and Paragraph 1.07 below. The maintenance instructions shall include troubleshooting data and full preventative maintenance schedules, and complete spare parts lists with ordering information.
15. Vibration and alignment test reports in accordance with requirements of Paragraph 3.01.
16. Field test results for inspection and testing performed in accordance with requirements of Paragraph 3.04 and Section 01465.
17. Written documentation provided by the manufacturer warranting the pump at the minimum flow condition as per Paragraph 2.02 C.
18. MANUFACTURER's Certificate of Installation, Testing and Instruction as specified in Section 01730.

A. Certification from the pump Manufacturer that pump and all wetted parts comply with NSF 61 and NSF 372 or NSF 61-G. Wetted parts shall also be compatible with chlorine concentrations specified. Additionally, provide certification that the wetted parts contain a weighted average lead content of less than 0.25%.

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B. CONTRACTOR shall conduct field testing under the direction of the MANUFACTURER. MANUFACTURER shall provide field test results for inspection and testing for vibration and performance in accordance with requirements of Paragraph 3.04 and Section 01465.

C. CONTRACTOR shall conduct leveling and alignment; final alignment shall be conducted under the direction of the MANUFACTURER. MANUFACTURER shall provide an alignment test report.

D. MANUFACTURER and CONTRACTOR shall each provide an individual agreement detailing the conditions of warranty. Warranty conditions shall comply with requirements listed in Paragraph 1.10.

E. In the event it is impossible to conform to certain details of the specifications due to different manufacturing techniques, describe completely all non-conforming aspects. Failure to describe any and all deviations from the Specifications will be a cause for rejection.

1.04 REFERENCE STANDARDS

A. Design, manufacturing, and assembly of elements of the equipment herein cited shall be in accordance with the standards of the below listed organizations. Where reference is made to a standard of one of these, or other organizations, the version of the standard in effect at the time of bid opening shall apply.
   1. American Gear Manufacturing Association (AGMA).
   2. American Institute of Steel Construction (AISC)
   3. American Iron and Steel Institute (AISI)
   4. American Society of Mechanical Engineers (ASME)
   5. American National Standards Institute (ANSI)
   6. American Society for Testing Materials (ASTM)
   7. American Water Works Association (AWWA)
   8. American Welding Society (AWS)
   9. Anti-Friction Bearing Manufacturers Association (AFBMA)
   10. Hydraulic Institute Standards (HI)
   11. Institute of Electrical and Electronics Engineers (IEEE)
   12. National Electrical Code (NEC)
   13. National Electrical Manufacturers Association (NEMA)
   14. Occupational Safety and Health Administration (OSHA)
   15. Steel Structures Painting Council (SSPC)
   16. Underwriters Laboratories, Inc. (UL)
   17. NSF International

1.05 QUALIFICATIONS

A. To assure unity of responsibility, the pumps, suction cans, supporting sole plates and/or fabricated steel base plates, motors, and couplings shall be furnished by the pump manufacturer or his authorized representative. The CONTRACTOR shall assume full responsibility for the satisfactory installation and operation of the entire

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pumping system including pumps, motors, connection to the VFDs, and controls as specified. The pumps shall be the standard catalogued product of a single pump Manufacturer.

B. The pumps covered by these Specifications shall be standard pumping equipment of proven ability as manufactured by a reputable Manufacturer having experience in the production of such pumps. The pumps furnished shall be designed, constructed, and installed in accordance with the best practice and methods and shall operate satisfactorily when installed. Pumps shall be manufactured in accordance with the Hydraulic Institute Standards.

C. All equipment furnished under this Specification shall be new and unused and shall be the standard product of manufacturers having a successful record of manufacturing and servicing the equipment and system specified herein for a minimum of five (5) years. The pump manufacturer shall assume unit responsibility for proper operation of pumps and motors.

D. The MANUFACTURER shall be fully responsible for the design, arrangement, and operation of all connected rotating components of the assembled pumping unit to ensure that neither harmful nor damaging vibrations occur at any speed within the specified operating range. Design shall include all supporting sole plates and/or fabricated steel base plate for mounting the units, as may be applicable.

1.06 DESCRIPTION OF SYSTEMS

A. Two (2) new variable speed vertical turbine can pumping units are required under this CONTRACT. The pumping units shall be located and arranged as shown on the Drawings.

B. The pumping units shall pull suction from barrels that are connected to the degasifier/aeration vessel via buried piping and discharge into a common header to the on-site ground storage tanks (GSTs).

C. All components of the pump that come into contact with water shall be NSF 61 and NSF 372 or NSF 61-G approved and certified. The pump manufacturer shall provide certification during the shop drawing process.

D. Pump materials should also be compatible with residual chlorine concentrations between 2 and 4 mg/L. Initial disinfection of pumps, which may include suction and discharge piping, shall be limited to concentration between 15-20 mg/L for 30 hours.

E. All working parts of the new pumps and motors, such as bearings, wearing rings, shaft, sleeves, motor windings, etc., shall be of standard dimensions built to limit gauges or formed to templates, such that parts will be interchangeable between like units, and such that the OWNER may at any time in the future obtain replacement and repair parts for those furnished in the original machine. All parts shall be properly

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stamped for identification and location in the machine as shown on the assembly drawings in the instruction books furnished.

1.07 OPERATING INSTRUCTIONS

A. Operating and maintenance manuals shall be furnished by the MANUFACTURER. The manuals shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, descriptions, etc. that are required to instruct operation and maintenance personnel unfamiliar with such equipment.

B. The number of copies and supplementary requirements shall be as specified in Section 01730.

1.08 TOOLS AND SPARE PARTS

A. The MANUFACTURER of the equipment specified herein shall furnish a complete list of recommended spare parts necessary for the first five years of operation of the pumping system.

B. One (1) set of all special tools required for normal operation and maintenance shall be provided. All such tools shall be furnished in a suitable steel tool chest complete with lock and duplicate keys.

C. Spare parts to be furnished:
   1. One (1) impeller
   2. Two (2) complete mechanical seals
   3. Two (2) sets of bearings
   4. Two (2) sets of wear rings

D. Spare parts shall be properly bound and labeled for easy identification without opening the packaging and suitably protected for long term storage.

1.09 PRODUCT HANDLING

A. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and the units and equipment are ready for operation. Refer to Section 01600 for additional details.

B. All equipment and parts must be properly protected against any damage during a prolonged period at the site.

C. Factory assembled parts and components shall not be dismantled for shipment unless permission is received in writing from the ENGINEER.

D. Finished surfaces of all exposed pump openings shall be protected by wooden blanks, strongly built, and securely bolted thereto.

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E. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.

F. After hydrostatic or other tests, all entrapped water shall be drained prior to shipment, and proper care shall be taken to protect parts from the entrance of water during shipment, storage, and handling.

G. Each box or package shall be properly marked to show its net weight in addition to its contents.

H. Wire motor space heaters while in storage such that they are continuously energized at a selectable temperature.

1.10 WARRANTY

A. All equipment supplied under this section shall be fully, 100% warranted for a period of one (1) year by the MANUFACTURER from the date of substantial completion, regardless of when the equipment is delivered to the site and no exception to this requirement will be considered. Warranty period shall commence as outlined in the General Conditions.

B. The equipment shall be warranted to be free from defects in workmanship, design, and materials. If any part of the equipment should fail during the warranty period, it shall be replaced in the machine(s) and the unit(s) restored to service at no expense to the OWNER.

C. The MANUFACTURER shall warrant performance of the pump pursuant to their approval of the CONTRACTOR's installation. CONTRACTOR shall warrant the overall installation against any installation defects.

D. Should a failure of the equipment due to material defect occur within the first year, the Warranty period shall reset for an additional year beginning on the day the equipment returns to service.

E. Warranty shall include all necessary parts, shipping and labor to repair the equipment inclusive of but in no way limited to: Factory authorized personnel inspection and identify cause of equipment issue, electrical disconnection, mechanical disconnection, rigging and removal of equipment, repair inclusive of delivery to and from site as well as all parts and labor, complete reinstallation, initial start up and test services and furnishing of a repair report.

PART 2 – PRODUCTS

2.01 MATERIAL AND EQUIPMENT

A. The equipment covered by these Specifications is intended to be standard pumping units of proven ability as manufactured by reputable MANUFACTURER having extensive experience in the production of such equipment. The equipment furnished

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shall be designed, constructed, and installed in accordance with the best practice and methods, and shall operate satisfactorily when installed as shown on the Drawings.

B. All equipment shall be designed and built for 24-hour continuous service at all points within the specified range of operation, without overheating, without cavitation, and without excessive vibration or strain.

C. The pumping units required under this section shall be complete, including pumps and motors, with proper alignment and balancing. All parts shall be so designed and proportioned as to have liberal strength, stability, and stiffness and to be especially adapted for the service to be performed. Ample room for inspection, repairs and adjustment shall be provided.

D. Stainless steel nameplates giving the name of the MANUFACTURER, model number, rated capacity, head, speed, unique manufacturer's serial number and all other pertinent data shall be attached to each pump and motor.

E. Each pumping unit and its driving equipment shall be designed and constructed to withstand the maximum turbine run-away speed of the units due to back flow through the pump with the maximum TDH specified available at the pump discharge flange. A statement of compliance with this requirement must be furnished with the shop drawing submittal.

F. The nameplate ratings of the motors shall not be exceeded, nor shall the design service factor be reduced when the pump is operating at any point on its characteristic curve at maximum speed. All rotating parts of the specified equipment shall be mechanically and hydraulically balanced so as to operate throughout the required range without excessive end thrust, vibration, and noise. Vibration readings shall comply with standards established by the Hydraulic Institute.

G. Mechanical equipment, including drives and electric motors shall be supplied and installed in accordance with applicable OSHA regulations. Stainless steel guards shall be installed on all rotation assemblies. The noise level of motors, unless otherwise noted, shall not exceed 80 dBA measured 1 feet from the units under free field conditions.

H. All lubrication fittings shall be brought to the outside of all equipment so that they are readily accessible from the outside without the necessity of removing covers, plates, housings, or guards. Fittings shall be buttonhead type. Lubrication fittings shall be mounted together wherever possible. Pressure grease-lubricated fittings shall be the "Zerk Hydraulic" type or the "Alemite" type. Housings of grease-lubricated bearings shall be automatically exhausted to the atmosphere to prevent excessive greasing.

2.02 PUMPS

A. The pumps shall be of the vertical turbine type designed to pump potable water with chlorine concentrations of up to 4 mg/L.

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B. The pumps shall be manufactured by Flowserve, Goulds, or Floway without exception and modified as required herein to meet all of the detailed hydraulic and mechanical requirements of these specifications.

C. Performance Requirements
   1. When operating at the maximum output speed of the motor, each pump shall have a characteristic performance curve that meets all the minimum conditions listed in Table 11214-1. Pump head and efficiency as defined herein refers to bowl head and efficiency. The pump and drive motor shall be capable of operating satisfactorily under the full range of conditions as defined by Table 11214-1, the figures at the end of this Section, and as described herein. The manufacturer shall provide written documentation warranting the pump to routinely operate at the minimum and maximum flow as well as warrant that the pump will operate within Hydraulic Institute (HI) standards for vibration at these conditions as demonstrated by factory acceptance testing.
   2. Each pump shall be identical in all respects.
   3. With the pumping units operating at full motor speed, the maximum brake horsepower required by pumps shall not exceed the horsepower listed in Table 11214-1 under any flow rate. If the pumping units require more than the horsepower listed in Table 11214-1 at the motor output shaft at any full motor speed operation point they will be rejected.
   4. When operating at maximum speed, the pumps shall not require a NPSH greater than that shown in the NPSHa curves shown at the end of this Section.
   5. The pumps, motors, and control system shall operate together to produce a flow and pressure as stated in Table 11214-1.
   6. There shall be no significant change in vibration and noise level within the entire normal range of operation as identified in graphical figures at the end of this Section. HI limits for acceptable vibration shall not be exceeded for normal operation points outside the HI defined POR, which manufacturer has warranted for satisfactory operation.
   7. Provide motor size as listed in Table 11214-1. Manufacturer shall certify that motor shall be non-overloading over the entire operating range identified, with actual pump and motor provided.

D. Pump Construction
   1. The discharge head shall be of the above base type and constructed of cast iron or fabricated steel. The discharge head and discharge connection shall be not less than the diameter as shown on the Drawings and as specified on Table 11214-1. The discharge connection shall be provided with 125-lb or 150-lb flat faced flange. The bottom of the baseplate shall be machined to mate with the suction vessel mounting plate.
   2. Incorporated in the fabrication of the discharge head shall be a suitable pump support base of standard dimensions to support both the pump and the motor.
   3. The pump head shaft shall be constructed of ASTM A582-416 Stainless Steel Alloy. Shaft diameter shall be determined by the AWWA Standard for Vertical Turbine Pumps – Line Shaft and Submersible Types, ANSI/AWWA E101 (latest), Section A4.1.5.

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4. MANUFACTURER shall provide a four-piece spacer coupling to allow the mechanical seal assembly to be removed without disturbing the motor.
5. Intermediate column lengths and lineshaft bearing spacing shall not exceed 10 feet. Column pipe shall accept ring spider bearing retainers. Spiders shall be stainless steel material and furnished to accommodate bronze shaft stabilization bearings at each column pipe coupling or flange. Bronze bearing retainer shall be installed in each spider.
6. The pump column shall be constructed of steel pipe in accordance with ASTM A36 or ASTM A53. The column shall not be less than Schedule 40 thickness, shall be the length as shown on the drawings, and shall be flanged at each end. The flanges shall mate with each other, the pump bowl assembly, and the discharge head with rabbeted fits to assure correct alignment. Bolts used to attach column flanges shall be constructed of 316 stainless steel.
7. The pump line shaft shall be constructed of ASTM AS82-416 stainless steel alloy and its diameter determined as described in 2.02 D.4. above.
8. The line shaft may have threaded type connections or split ring and keyed type couplings constructed of 410 or 416 stainless steel. Line shaft couplings of an alternate design acceptable to the ENGINEER may be utilized.
9. The pump impellers shall be of the enclosed type constructed of ASTM C95800 nickel aluminum bronze or 316 stainless steel. The impellers shall be attached to the shaft by means of an ASTM AS82-416 stainless steel key or locking collet for positive driving of the impeller by the shaft.
10. The pump bowls shall be constructed of ASTM A48 class 30 cast iron having a minimum tensile strength of 30,000 psi. The pump bowls shall be of sufficient thickness to withstand stresses and strains at full operating pressure. The bowls shall be subjected to a hydrostatic test 150 percent of that specified at the minimum pump shut-off head condition in Table 11214-1. The bowls shall be designed and manufactured with open and smooth water passages to assure efficient, reliable operation. All bowl and column hardware shall be 316 SS.
11. The pump shall be equipped with cartridge type mechanical seals as manufactured by pump MANUFACTURER, by Chesterton, John Crane, or ENGINEER approved equal. Seal materials of construction shall be 316 SS, stationary face is to be carbon, rotating face reaction bonded silicon carbide or tungsten carbide, and the springs are to be 316 SS and to be isolated from the process. The elastomers shall be Viton.
    a. Seal glands shall be 316SS and have two flush ports drilled and tapped 180 degrees apart.
    b. Pump seals shall be furnished with external seal flush piping to be connected to the volute (API Plan 13). The tubing and valves shall be furnished by the MANUFACTURER and installed by the CONTRACTOR.
12. Each pump shall include a drain pipe from the pump piped to the floor as shown on the Drawings such that any leakage from the seals is piped away from the pump. CONTRACTOR shall provide a minimum 1-inch NPT drain connection with minimum 1-inch Schedule 10 316 SS pipe. The MANUFACTURER shall provide tapped connections for mounting brackets to support this piping.

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13. The supporting sole plate, if required by the manufacturer, shall be a separate fabricated steel plate, complete with all accessories required, with tapped holes machined to mate with the discharge head baseplate. The pump manufacturer shall determine the dimensions and thickness.
14. Pump Coating: All coatings (interior and exterior) coming into contact with the pumped product shall be NSF 61 approved for potable water. All portions of the bowls (interior and exterior), column, and pump discharge head not exposed to view shall have an exterior coating of high build modified epoxy of a minimum of 10 to 12 mils dry thickness, compatible with the pump service. Interior surfaces coming into contact with the pumped product shall be coated with a ceramic epoxy or porcelain enamel.
    a. The CONTRACTOR shall field paint the final exterior coating per Section 09900. Surface preparation and shop priming shall be in accordance with the Manufacturer's recommendations.

2.03 PUMP SUCTION BARRELS (CANS)

A. The suction barrels for the pumps shall be designed and supplied by the pump Manufacturer and shall be of the length and diameter required to accept pumps which meet the specified conditions. The minimum suction barrel diameter shall not be less than that specified on Table 11214-1. The barrel design shall meet all requirements of the Hydraulic Institute's Pump Intake Design ANSI/HI 9.8-1998.

B. The barrel diameter shall be determined by the pump MANUFACTURER. However, the annular flow velocity shall not exceed five (5) feet per second at the primary conditions listed in Table 11214-1. The barrels shall be of the minimum dimensions as shown on the Drawings and as specified on Table 11214-1.

C. Pump Suction Barrel Construction
    1. The pump suction barrel shall be constructed of ASTM A-36 steel in accordance with the recommendations of the pump Manufacturer.
        a. The barrel interior and exterior shall be coated with an approved epoxy coating of 6 to 8 mils dry thickness suitable for intended used. All coatings shall be NSF 61 approved for potable water.
        b. The barrel exterior shall be wrapped in an enhanced polyethylene encasement that inhibits the formation of corrosion such as V-Bio by ACIPCO or ENGINEER approved equal. Encasement shall be provided and installed by the CONTRACTOR.
    2. The barrel shall be not less than 3/8-inch minimum wall thickness of ASTM A-36 steel designed for a maximum pressure of 25 psi. The minimum barrel length provided shall meet the dimensions shown on the Drawings.
    3. The minimum distance between the centerline of the suction pipe and the bottom of the pump bowl shall not be less than twice the suction barrel diameter plus the length the shaft protrudes past the suction bell plus an additional minimum 3-inch margin. Refer to drawings for required dimensions.
    4. The barrel support plate dimensions shall be determined by the pump Manufacturer, but shall not be less than 1-1/2 inches in thickness, drilled and

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tapped ANSI B.16.B2 standard flanged dimensions to attach the pump discharge head base to the barrel support plate. It is desired that the barrel to the pump discharge head base sealing be accomplished using a rubber 0-ring mounted in a rabbited channel inside the bolt circle. Alternatively, a 1/8-inch thick (minimum) neoprene gasket shall be used to seal the pump head to the barrel support plate. The barrel support plate shall be precision machined by the Manufacturer to assure proper fit with the pump discharge head base.

5. The suction barrel assembly shall be hydrostatically pressure tested at 25 psi. Test report to be included within operation and maintenance manuals.
6. Manufacturer shall provide a means for vortex suppression. An internal vertical flow splitter or other approved device shall be installed within the pump suction barrel to prevent the possibility of fluid circulation around the pump bowl assembly. The details of installations and dimensions shall be as recommended by the pump Manufacturer and approved by the ENGINEER.

2.04 MOTORS

A. General

1. Motors shall be TEFC, premium efficiency, squirrel-cage induction motors. Motors with shaft diameters greater than 1.5 inches shall be provided with a VERTICAL SOLID SHAFT, without exception.
2. Motors must be designed to accept all loads imposed by pump during starting and running.
3. All motors shall be built in accordance with latest NEMA, IEEE, ANSI and AFBMA standards where applicable.
4. Motors shall be inverter duty rated, Class H insulated, for service with VFD’s.
5. Motors shall conform to all requirements of this Section and with the specifications for motors included in Section 16150.
6. Pumps and motors shall be designed and manufactured to operate on VFD systems and to eliminate stray current electrolysis of all components including pump and motor bearings and shafts.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Installation shall be in strict accordance with the MANUFACTURER's instructions and recommendations at the locations shown on the Drawings. Installation shall include furnishing the required oil and grease for initial operation. The grades of oil and grease shall be in accordance with the MANUFACTURER's recommendations. Anchor bolts shall be set in accordance with the MANUFACTURER's recommendations.

B. Upon completion of the booster pump station, the CONTRACTOR shall submit a certificate from the MANUFACTURER stating that the installation of the equipment is satisfactory, that the equipment is ready for operation, and that the operating personnel have been suitably instructed in the operation, lubrication, and care of each unit.

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C. Pump Suction Barrel Alignment
   1. The alignment of pump suction barrels shall be checked at regular intervals during suction barrel installation and prior to the construction of booster station pump room slab.
   2. Tolerances for pump suction barrel vertical alignment shall be no greater than 1/8- inch per 20 feet of barrel depth.
   3. Results of such alignment checks shall be provided to the ENGINEER.

3.02 SHOP PAINTING

A. Before exposure to weather and prior to shop painting all surfaces shall be thoroughly cleaned, dry and free from all mill-scale, rust, grease, dirt, and other foreign matter.

B. All exposed portions of the pumps and motors shall be shop primed, with primer compatible with field painting as specified in Division 9.

C. All nameplates shall be properly protected during painting.

D. Gears, bearing surfaces, and other similar surfaces obviously not to be painted shall be given a heavy shop coat of grease or other suitable rust resistant coating. This coating shall be maintained as necessary to prevent corrosion during periods of storage and erection and shall be satisfactory to the ENGINEER up to the time of the final acceptance test.

3.03 FIELD PAINTING

A. Field painting is specified under Painting, Division 9. The primer and paint used in the shop shall be products of the same MANUFACTURER as the field paint to assure compatibility. All intermediate and finish coats shall be field applied by the CONTRACTOR in accordance with Division 9.

B. Nameplates shall be properly protected during painting.

3.04 INSPECTION AND TESTING

A. General
   1. The ENGINEER shall have the right to inspect, test or witness tests of all materials or equipment to be furnished under these specifications, prior to their shipment from the point of manufacture.
   2. The ENGINEER shall be notified in writing prior to initial shipment, in ample time so that arrangements can be made for inspection by the ENGINEER.
   3. Field tests shall not be conducted until such time that the entire installation is complete and ready for testing.
   4. The pumps shall be tested to HI Acceptance Grade 1U (with the expectation that power shall be limited to +5%) with the selected performance criteria of brake horsepower less than or equal to 100 hp. Should pump power

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exceedance be identified during testing, Contractor shall confirm that VFD's are sufficiently sized to accommodate increased motor amperage.

B. Factory Pump Tests

1. MANUFACTURER shall record any testing performed on the pump in the factory. MANUFACTURER is not permitted to trim the impeller more than what was in the approved shop drawings submittal without written approval from the ENGINEER and OWNER.
2. Certified factory performance testing shall be performed by the pump manufacturer for the booster pump in accordance with the standards of the Hydraulic Institute. The tests shall be witnessed by a test lab manager employed by the MANUFACTURER. The test data and performance curves shall be signed by the test lab manager who witnessed the test. A shop motor may be utilized for all factory testing to confirm pump performance. Pump shall not be shipped until tests have been submitted and approved by the ENGINEER.
    a. Factory performance testing shall be performed by the pump manufacturer in accordance with the standards of the Hydraulic Institute shall be required for each pump. Hydraulic and electrical performance tests shall measure capacity, head, power, current, speed, and voltage at a minimum of six evenly spaced points for each speed. Test points shall include shut-off head and a maximum flow of at least 125% of the flow at best efficiency point while operated on a VFD at 10% speed increments from 50% to 100% speed. The remaining points shall be evenly spaced along the curve. This array will result in 36 data points for each pump. Proposed testing method and points shall be submitted to ENGINEER for approval during shop drawing review and prior to testing.
    b. An NPSH test shall be performed on one pump for each pump model under this specification to substantiate the maximum NPSHr for the pump at the flow rate listed in Table 11214-1, unless historical values of the same model and impeller trim are submitted in lieu of actual test data.
    c. Provide vibration readings in the X, Y, and Z axes at every test point recording (the 36 points identified above) and reported in mm/s or in/sec RMS in accordance with ANSI/HI 9.6.4. If required by the MANUFACTURER and approved by the ENGINEER, the number of test points may be reduced, but, at a minimum, the vibration recordings shall be taken at points of flow and head as follows: 1 recording at the lower bound of the allowable operating region (AOR), 1 recording at the lower bound of the preferred operating region (POR), 1 recording at the BEP, 1 recording at the higher bound of the POR, and 1 recording at the higher bound of the AOR, for each speed tested. Manufacturer shall identify the AOR within testing submittal.
    d. Testing data shall identify the BEP and manufacturers minimum recommended flow rate (minimum continuous stable flow, MCSF) at every given speed.

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e. Certified pump tests shall be conducted through the specified range of flow vs. head/capacity/efficiency curves plotted at pump design speed. During each test, the pump shall be run at each head/capacity condition as specified in the pump schedule for sufficient time to accurately determine and record capacity, head, drawn amperage, pump efficiency, and motor efficiency. If the pump fails to meet any specification requirement, MANUFACTURER shall provide testing data for review by the ENGINEER prior to modifying the pump. Fine polishing or application of coatings to the impeller shall not be performed without the written authorization of the ENGINEER.

3. All electronic transducers, meters, gauges, and other test instruments shall be calibrated within the required calibration periods as defined by the Hydraulic Institute and the MANUFACTURER'S quality control program. Differential pressure type flow meters, such as venturis shall have been calibrated within 5 years. Mechanical variation of the meter throat diameter will be accepted as verification of calibration validity.
4. A description of the MANUFACTURER's test equipment, test procedures, and pump/motor/piping configuration shall be submitted and approved prior to conducting the test.
5. Test configuration shall match HI standard. If test pit water temperature does not match HI standard, MANUFACTURER shall provide hp and amperage adjustment graphs, to account for density differences, with test plan submittal
6. Mechanical and electrical integrity shall be established both before and after testing by physical inspection and by use of a megger.
7. A failure of any pumping unit meeting the operating requirements specified, for any reason, shall be considered an incomplete test. Upon correction of the problem causing failure, the pumping unit shall be re-tested.
8. No pump may be released for shipment without ENGINEER's authorization.
9. All costs associated with any testing delay, retesting or additional testing shall be the sole responsibility of the MANUFACTURER.
10. Should resonant frequencies or excessive vibrations be identified during certified factory performance testing of the equipment, these shall immediately be advised to the OWNER and ENGINEER. If determined necessary by the ENGINEER, a Frequency/Vibration Analysis may be required at no cost to the OWNER to prove system.

C. Field Inspection and Owner Instruction

1. The CONTRACTOR shall furnish the services of the MANUFACTURER's field services technician, who has complete knowledge of proper operation and maintenance of the equipment, for a period of not less than two (2) days to inspect and adjust the installed equipment, supervise the initial test run, and to provide instruction to the plant personnel. One day is defined as 8-hours at the site, travel and lodging time are not included. If there are difficulties in operation of the equipment due to the MANUFACTURER's design or fabrication, additional service shall be provided at no cost to the OWNER.
2. One day shall be dedicated to checking and inspecting the equipment after it is installed and to operate and supervise the initial field test.

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3. One day shall be dedicated solely to instruction of plant personnel in operation and maintenance of the equipment. The instruction period shall be scheduled at least 10 days in advance with the OWNER and shall take place prior to start up and acceptance by OWNER. The final copies of operation and maintenance manuals specified in Section 01730 must be delivered to the ENGINEER prior to scheduling the instruction period with the OWNER.

D. Field Pump Tests Performed by CONTRACTOR

1. In the presence of the ENGINEER such tests as necessary to indicate that the pumps, motors, and control system conform to the operating conditions specified shall be performed. The test shall be conducted through three complete start/stop cycles and the field conditions necessary to start/stop the motors shall be coordinated with SJCUD operations staff. Each test cycle shall be observed and approved by the ENGINEER with each cycle providing opportunity for control adjustments as required. If a pump performance does not meet the specified requirements, corrective measures must be taken.
2. Written test procedures shall be submitted to the ENGINEER for approval 30 days prior to testing. Certified results of tests shall be submitted. Provide, calibrate, and install all temporary gauges and meters, make necessary tapped holes in the pipes, and install all temporary piping and wiring required for the field acceptance tests.
3. After installation of the pumps and as soon as conditions permit operation, retain the services of a qualified independent mechanical testing firm to perform noise and vibration tests; detailed vibration signature analysis of each unit, including both "Bump Tests" and X-Y vibration profiles, to (a) prove compliance with the specified vibration limitations and (b) prove there are no field installed resonant conditions due to misalignment, the foundation, or the connecting piping and its supports, when operating at any speed within the specified operating range. A written report shall be submitted including a sketch of the unit indicating on where and in which direction the vibration readings were taken and recorded showing (a) peak-to-peak displacement, in mils, (b) frequency and a peak velocity level, in inches per second. The report shall contain a complete analysis of their findings, describing any problems encountered, if any, probable cause, and specific recommendations for any required corrective action.
    a. Each pump will be tested at a minimum of two different speeds as determined by the ENGINEER after the Factory Acceptance Testing. Points at each speed will include a maximum flow of at least 125% of flow at the best efficiency point and an additional four points along the curve as determined by the ENGINEER at the time of testing.
    b. Additional speeds may be required if any excessive vibrations are identified during Factory Acceptance Testing.
    c. Vibration testing of multiple (up to three) pumps operating in parallel will also occur during system performance testing. Testing will be at 100% pump speed and will consist of a maximum of ten (10) scenarios to be selected by the ENGINEER. Modifications to this testing protocol may occur depending on system operation during the time of testing.

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4. Noise and vibration tests shall be conducted in conformance with the Hydraulics Institute Test Codes and OSHA Standards for Occupational Noise Exposure. Maximum allowable noise level, corrected for background sound, shall not exceed 80 dBA when measured at a horizontal distance of 1 feet from the equipment being tested. Maximum allowable vibration shall not exceed the limits established by HI standards. The actual natural frequency of the installed pumping units will be verified using industry accepted procedures.
5. All pump operating settings, alarms, controls, and shutdown devices shall be calibrated and tested during the field tests.
6. The CONTRACTOR shall furnish all facilities, labor, materials, supplies, and test instruments required to conduct field test.
7. Deliver to the ENGINEER, upon completion of satisfactory testing of the equipment, reports as specified in Part 1.

E. Field Electric Control System Tests
1. The CONTRACTOR shall check all drives for correct clearances, alignment, and lubrication, prior to start up, in accordance with the respective MANUFACTURER's instructions.
2. Check each alarm and detection device for proper operation.

F. Field Motor Tests
1. The CONTRACTOR shall megger each motor winding while uncoupled and before energizing the motor, and, if insulation resistance is found to be low shall notify the ENGINEER and shall not energize the motor.
2. The CONTRACTOR shall check all motors for correct clearances and alignment and for correct lubrication in accordance with MANUFACTURER's instructions. The CONTRACTOR shall check direction of rotation of all motors and reverse connections if necessary.
3. The CONTRACTOR shall meet all the testing requirements of Division 16.

4. Proper rotation shall be checked. If motors are found to be turning backward on initial start up, Contractor will be required to correct phasing at the pump motor junction box. Correcting by rephasing at the VFD or by VFD parameter settings will not be permitted.

G. Field Alarm System Testing:
1. Check each alarm and detection device for proper operation.

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SECTION 11214

VERTICAL TURBINE CAN PUMPS

TABLE 11214-1

PUMPING UNIT DESIGN REQUIREMENTS

Discharge Location	GST Feed Pumps
Hydraulic Institute Acceptance Grade	1U
Number of Pumps (Operating/Standby)	2 (1/1)
Nominal Maximum Motor Speed (rpm)	1,200
Pump Motor Horsepower (hp)	15
Minimum Pump Shut-Off Head[a] (feet)	48.2
Design Capacity[a] (gpm)	1,050
Minimum TDH at Design Capacity[a] (feet)	31.3
Minimum Overall Pump Hydraulic Efficiency at Design Capacity[a,b] (%)	77.9
Maximum NPSHr (ft) at Design Capacity	8.77
Maximum Nominal Bowl Diameter (inches)	13.63
Maximum Bell Suction Diameter (inches)	12
Minimum Discharge Head Connection (inches)	8
Minimum Headshaft Diameter (inches)	1.00
Minimum Impeller Diameter (inches)	9.68
Minimum Column Diameter (inches)	8
Minimum Can Length (inches)	149.9
ENGINEER approved pump Manufacturers (models)	Goulds (14RJHC_1)

(a) Condition represents at maximum motor speed as listed herein.

(b) Conditions shown reflect pump head and efficiency.

END OF SECTION 11214

SECTION 11270

DUPLEX GRINDER PUMP STATION

PART 1 – GENERAL

1.01 GENERAL DESCRIPTION

A. The MANUFACTURER shall furnish complete factory-built and tested one explosion proof duplex grinder pump station that meets Factory Mutual (FM) explosion proof equipment standards. The system shall consist of a grinder pump core suitably mounted on an integral stand of stainless steel, electrical quick disconnect (NEMA 6P), pump removal harness, discharge assembly and shut-off valve, anti-siphon valve and check valve assembly, electrical alarm assembly, and all necessary internal wiring and controls.

1.02 SUBMITTALS

A. Submittals for the equipment specified herein shall be prepared and submitted to the ENGINEER in accordance with the provisions of Section 01300.

B. The MANUFACTURER shall supply copies of the operation and maintenance manuals in accordance with section 01730.

1.03 QUALIFICATIONS

A. The grinder pump station, complete with all appurtenances, form an integral system, and as such, shall be supplied by one grinder pump station manufacturer. The CONTRACTOR shall be responsible for the satisfactory operation of the entire system. The equipment specified shall be a product of a company experienced in the design and manufacture of grinder pumps for specific use in low pressure sewage systems. The company shall submit detailed installation and user instructions for its product, submit evidence of an established service program including complete parts and service manuals, and be responsible for maintaining a continuing inventory of grinder pump replacement parts. The MANUFACTURER shall provide a reference and contact list from ten of its largest contiguous grinder pump installations of the type of grinder pumps described within this specification.

B. The MANUFACTURER of the grinder pump station shall be Flygt/Xylem, E-One, or ENGINEER approved equal.

C. The equipment furnished hereunder shall be the product of a company experienced in the design and manufacture of grinder pumps specifically designed for use in low pressure systems. All manufacturers proposing equipment for this project shall have at least 10 years of experience in the design and manufacture of units of identical size(s) and performance to the specified units. All manufacturers proposing equipment for this project must also provide evidence of successful installations of low pressure sewer systems utilizing grinder pumps of like type to the grinder pumps specified herein.

D. Attention is directed to the fact that the drawings and overall system design are based on a particular piece of equipment from a particular manufacturer. These specifications are intended to provide guidelines for standard equipment of a

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recognized manufacturer who already meets all the requirements of this specification.

1.04 OPERATING CONDITIONS

A. The pumps shall be capable of delivering a minimum of 15 GPM against a rated total dynamic head of 30 feet. The pump(s) must also be capable of operating at negative total dynamic head without overloading the motor. Under no conditions shall in-line piping or valving be allowed to create a false apparent head.

1.05 WARRANTY

A. The grinder pump MANUFACTURER shall provide a part(s) and labor warranty on the complete station and accessories, including, but not limited to, panel and redundant check valve, for a period of 12 months after substantial completion. Any manufacturing defects found during the warranty period will be reported to the Manufacturer by the OWNER and will be corrected by the Manufacturer at no cost to the OWNER.

B. The equipment shall be warranted to be free from defects in workmanship, design and materials. If any part of the equipment should fail during the warranty period, it shall be replaced in the machine(s) and the unit(s) restored to service at no expense to the OWNER.

C. The MANUFACTURER'S warranty period shall run concurrently with the CONTRACTOR'S warranty period. No exception to this provision shall be allowed.

PART 2 – PRODUCTS

2.01 PUMP

A. Each pump shall be a custom-designed, integral, vertical rotor, motor driven, solids handling pump of the semi-positive displacement type with a single mechanical seal. The rotor shall be constructed of stainless steel. Plating on the rotor will not be acceptable due to its tendency to delaminate. The stator shall be of a specifically compounded ethylene-propylene synthetic elastomer. The material shall be suitable for domestic wastewater service. Its physical properties shall include high tear and abrasion resistance, grease resistance, water and detergent resistance, temperature stability, excellent aging properties, and outstanding wear resistance. Buna-N is not acceptable as a stator material because it does not exhibit the properties as outlined above and required for wastewater service.

2.02 GRINDER

A. The grinder shall be placed immediately below the pumping elements and shall be direct-driven by a single, one-piece motor shaft. The grinder impeller assembly shall be securely fastened to the pump motor shaft by means of a threaded connection attaching the grinder impeller to the motor shaft. Attachment by means of pins or keys will not be acceptable. The grinder will be of the rotating type with a

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stationary hardened and ground stainless steel shredding ring spaced in close annular alignment with the driven impeller assembly, which shall carry two hardened type 400 series stainless steel cutter bars.

B. This assembly shall be dynamically balanced and operate without objectionable noise or vibration over the entire range of recommended operating pressures. The grinder shall be constructed so as to eliminate clogging and jamming under all normal operating conditions including starting. Sufficient vortex action shall be created to scour the tank free of deposits or sludge banks which would impair the operation of the pump. These requirements shall be accomplished by the following, in conjunction with the pump:
   1. The grinder shall be positioned in such a way that solids are fed in an upward flow direction.
   2. The maximum flow rate through the cutting mechanism must not exceed four feet per second. This is a critical design element to prevent jamming and as such must be integral to the design.
   3. The inlet shroud shall have a diameter of no less than five inches. Inlet shrouds that are less than five inches in diameter will not be accepted due to their inability to maintain the specified four feet per second maximum inlet velocity which by design prevents unnecessary jamming of the cutter mechanism and eliminates blinding of the pump by large objects blocking the inlet shroud.
   4. The impeller mechanism must rotate at a nominal speed no greater than 1800 rpm.

C. The grinder shall be capable of reducing all components in normal domestic sewage, including a reasonable amount of “foreign objects,” such as paper, wood, plastic, glass, rubber and the like, into finely divided particles which will pass freely through the passages of the pump and the 1-1/2-inch diameter discharge.

2.03 ELECTRIC MOTOR

A. As a maximum, the motor shall be a maximum 2 HP, nominal 1800 RPM, 208 Volt 60 Hertz, three phase, capacitor start, ball bearing, air-cooled induction type with a low starting current not to exceed 30 amperes and high starting torque of 8.4 foot pounds. Inherent protection against running overloads or locked rotor conditions for the pump motor shall be provided by the use of an automatic reset, integral thermal overload protector incorporated into the motor. This motor protector combination shall have been specifically investigated and listed by Underwriters Laboratories, Inc., for the application. Non-capacitor start motors or permanent split capacitor motors will not be accepted because of their reduced starting torque and consequent diminished grinding capability. To reduce the potential of environmental concerns, the expense of handling and disposing oil, and the associated maintenance costs, oil-filled motors will not be accepted.
   1. Should a different voltage be required, it will be the CONTRACTOR’s responsibility to coordinate and provide a transformer and related equipment to result in a functional system.

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2.04 MECHANICAL SEAL

A. The pump/core shall be provided with a mechanical shaft seal to prevent leakage between the motor and pump. The seal shall have a stationary ceramic seat and carbon rotating surface with faces precision lapped and held in position by a stainless steel spring.

2.05 WET WELL

A. The wet well shall be made of fiberglass reinforced plastic (FRP) of a grade selected for environmental stress cracking resistance. Corrugated sections are to be made of a double wall construction with the internal wall being generally smooth to promote scouring. Corrugations of outside wall are to be of a minimum amplitude of 1 1/2-inch to provide necessary transverse stiffness.

B. Any incidental sections of a single wall construction are to be a minimum 0.250 inch thick. All seams created during wet well construction are to be thermally welded and factory tested for leak tightness. Wet well wall and bottom must withstand the pressure exerted by saturated soil loading at maximum burial depth. All station components must function normally when exposed to maximum external soil and hydrostatic pressure. The wet well shall be bedding and backfilled in accordance with Division 2 and the geotechnical report.

C. The wet well shall be furnished with field-installed EPDM inlet grommets to accept a 3-inch Sch 40 DWV pipe and a 1-1/4-inch Sch 80 PVC pipe from the sump pump discharge. These connection locations shall be coordinated between the CONTRACTOR per the drawings. Wet well dimensions and capacities shall be as shown on the Drawings.

D. The wet well shall include a lockable cover assembly providing low profile mounting and watertight capability. Access way design and construction shall facilitate field adjustment of station height in increments of 4-inch or less without the use of any adhesives or sealants requiring cure time before installation can be completed.

E. All penetrations shall be completely sealed and leak tested.

2.06 DISCHARGE HOSE AND DISCONNECT/ VALVE

A. All discharge fittings and piping shall be constructed of 304 series stainless steel, polypropylene, EPDM or PVC. The discharge hose assembly shall include a shut-off valve rated for 200 psi WOG and a quick disconnect feature to simplify installation and pump removal. The bulkhead penetration shall be factory installed and warranted by the manufacturer to be watertight.

2.07 ANTI-SIPHON VALVE

A. The pump discharge shall be equipped with a factory-installed, gravity-operated, flapper-type integral anti-siphon valve built into the discharge assembly. Moving

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parts will be made of 300 series stainless steel and fabric-reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength.

B. A nonmetallic hinge shall be an integral part of the flapper assembly, providing a maximum degree of freedom to ensure proper operation even at a very low pressure. The valve body shall be injection-molded from a glass-filled thermoplastic resin. Holes or ports in the discharge piping are not acceptable anti-siphon devices due to their tendency to clog from the solids in the slurry being pumped.

2.08 CHECK VALVE

A. The pump discharge shall be equipped with a factory-installed, gravity operated, flapper-type integral check valve built into the discharge assembly. The check valve will provide a full-ported passageway when open and shall introduce a friction loss of less than six inches of water at maximum rated flow. Moving parts will be made of a 300 series stainless steel and fabric reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A nonmetallic hinge shall be an integral part of the flapper assembly providing a maximum degree of freedom to assure seating even at a very low back pressure. The valve body shall be an injection molded part made of glass filled PVC. Ball-type check valves are unacceptable due to their limited sealing capacity in slurry applications.

B. The grinder pump installation shall also include one separate check valve of the type detailed in this section for installation in the 1¼-inch grinder pump station discharge pipe.

2.09 WET WELL VENT

A. A vent shall be installed in the wet well cover. The vent shall consist of a 2-inch 316 SS threaded mounting flange, 2-inch 316 SS nipple, and a Wager 2100 mushroom check valve. The top shall be tapped and mounting flange connected to the lid per the wet well MANUFACTURER recommendations.

2.10 CORE UNIT

A. The grinder pump station shall have an easily removable core assembly containing pump, motor, grinder, all motor controls, check valve, anti-siphon valve, electrical quick disconnect and wiring. The watertight integrity of the core unit shall be established by 100 percent factory test at a minimum of five PSIG.

2.11 CONTROLS

A. All necessary controls, including motor and level controls, shall be located in the top housing of the core unit. The top housing will be attached with stainless steel fasteners.

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B. Non-fouling wastewater level controls for controlling pump operation shall be accomplished by monitoring the pressure changes in an integral air column connected to a pressure switch. The level detection device shall have no moving parts in direct contact with the wastewater. High-level sensing will be accomplished in the manner detailed above by a separate air-bell sensor and pressure switch of the same type. Closure of the high-level sensing device will energize an alarm circuit as well as a redundant pump-on circuit. For increased reliability, pump ON/ OFF and high-level alarm functions shall not be controlled by the same switch. Float switches of any kind, including float trees, will not be accepted due to the periodic need to maintain (rinsing, cleaning) such devices.

C. To assure reliable operation of the pressure switches, each core shall be equipped with a breather assembly, complete with a suitable means to prevent accidental entry of water into the motor compartment. The grinder pump will be furnished with a 6-conductor, 12-gauge, type SJOW cable, pre-wired and watertight to meet UL requirements with a FACTORY-INSTALLED NEMA 6P EQD half attached to it.

2.12 CONTROL PANEL

A. The grinder pump station shall include a corrosion-proof, thermoplastic polyester NEMA 4X, UL-listed control panel suitable for wall mounting. The control panel shall be designated as VCP-630. The enclosure shall include a hinged, lockable cover with padlock, preventing access to electrical components, and creating a secured safety front to allow access only to authorized personnel.

B. The control panel shall contain two 15-amp, 3 pole circuit breakers for the pump core’s power circuit and one 15-amp single-pole circuit breaker for the alarm circuit. The panel shall contain a push-to-run feature, an internal run indicator, and a complete alarm circuit. All circuit boards in the control panel are to be protected with a conformal coating on both sides and the AC power circuit shall include an auto resetting fuse.

C. The control panel shall include the following features: external audible and visual alarm; push-to-run switch; push-to-silence switch; redundant pump start; and high-level alarm capability. When the pump and alarm breakers are on, the alarm sequence is to be as follows:
   1. When liquid level in the sewage wet well rises above the alarm level, audible and visual alarms are activated.
   2. The audible alarm may be silenced by means of the externally mounted, push-to-silence button.
   3. Visual alarm remains illuminated until the sewage level in the wet-well drops below the “off” setting of the alarm pressure switch.
   4. Service equipment/ main service disconnect breaker – A separate internal breaker, rated and approved for use as “service equipment,” which also acts as a main service disconnect of the grinder pump station, shall be provided.
   5. Run-time/ hour Meter – A run-time or hour meter shall be provided to display the total run-time or operation time for the pump core.

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D. The visual alarm lamp shall be inside a red, oblong lens at least 3.75-inch L x 2.38-inch W x 1.5-inch H. Visual alarm shall be mounted to the top of the enclosure in such a manner as to maintain the NEMA 4X rating. The audible alarm shall be externally mounted on the bottom of the enclosure, capable of 93 dB @ 2 feet. The audible alarm shall be capable of being deactivated by depressing a push-type switch that is encapsulated in a weatherproof silicone boot and mounted on the bottom of the enclosure (push-to-silence button).

E. The entire control panel shall be listed by Underwriters Laboratories, Inc.

F. Grinder pump run status, wet well levels, and system fault status shall be transmitted to the main control panel SCP-1.

2.13 SERVICEABILITY

A. The grinder pump core unit shall have two lifting hooks, complete with nylon lift-out harness, to facilitate easy core removal when necessary. All mechanical and electrical connections must provide easy disconnect capability for core unit removal and installation. A push to run feature will be provided for field trouble shooting. All motor control components shall be mounted on a readily replaceable bracket for ease of field service.

2.14 OSHA CONFINED SPACE

A. All maintenance tasks for the grinder pump station must be possible without entry into the grinder pump station (as per OSHA 1910.146 Permit-required confined spaces). *"Entry means the action by which a person passes through an opening into a permit-required confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space."*

2.15 SAFETY

A. The grinder pump shall be free from electrical and fire hazards as required in a residential environment. As evidence of compliance with this requirement, the completely assembled and wired grinder pump station in its tank shall be listed by Underwriters Laboratories, Inc., to be safe and appropriate for the intended use. UL listing of components of the station or third-party testing to UL standard will not be accepted.

B. The grinder pump shall meet accepted standards for plumbing equipment for use in or near residences, shall be free from objectionable noise, odor, or health hazards, and shall have been tested by an independent laboratory to certify its capability to perform as specified in either individual or low pressure sewer system applications. As evidence of compliance with this requirement, the grinder pump shall bear the National Sanitation Foundation seal. Third-party testing to NSF standards will not be accepted.

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PART 3 – EXECUTION

3.01 FACTORY TEST

A. The grinder pump shall be submerged and operated for five minutes (minimum). Included in this procedure will be the testing of all ancillary components such as, the anti-siphon valve, check valve, discharge line and each unit's dedicated level and motor controls. All factory tests shall incorporate each of the above listed items. Actual appurtenances and controls which will be installed in the field shall be particular to the tested pump only. A common set of appurtenances and controls for all pumps will not be acceptable. Certified test results shall be available upon request showing the operation of the grinder pump at two different points on its curve, with the maximum pressure no less than 60 psi.

B. Completed wetwell shall be factory leak tested to assure the integrity of all joints, seams and penetrations.

3.02 DELIVERY

A. The grinder pump unit shall be delivered to the job site, 100 percent completely assembled, including testing, ready for installation. Grinder pump station will be individually mounted on wooden pallet. Grinder pump core will be shipped in a separate container and is only required to be installed in the basin.

3.03 INSTALLATION

A. Earth excavation and backfill are specified in Division 2 of these Specifications, but are also to be done as a part of the work under this section, including any necessary sheeting and bracing. The CONTRACTOR shall be responsible for handling ground water to provide a firm, dry subgrade for the structure, and shall guard against flotation or other damage resulting from general ground water or flooding. The grinder pump station shall not be set into the excavation until the installation procedures and excavation have been approved by the ENGINEER. Also refer to the geotechnical report.

B. Remove packing material. User instructions MUST be given to the OWNER. Hardware supplied with the unit, if required, will be used at installation. The basin may not be dropped, rolled or laid on its side at any time for any reason.

C. Installation shall be accomplished so that 1-inch to 6-inch of access way extends above the finished grade line. The finished grade shall slope away from the unit. The diameter of the hole must be large enough to allow for the concrete anchor.

D. A 6-inch inch (minimum) layer of naturally rounded, clean and free-flowing aggregate, No. 57 stone, shall be used as bedding material under the unit. A concrete anti-flotation collar, sized according to the manufacturer's instructions, shall be required and shall be precast to the grinder pump or poured in place. The grinder pump station with its precast anti-flotation collar shall have a minimum of three lifting eyes for loading and unloading purposes. The unit shall be leveled, and

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filled with water, to the bottom of the inlet, to help prevent the unit from shifting while the concrete is being poured and set. The concrete must be manually vibrated to ensure there are no voids. If it is necessary to pour the concrete to a level higher than the inlet piping, an 8-inch sleeve is required over the inlet prior to the concrete being poured.

E. The electrical enclosure shall be furnished, pole-mounted adjacent to the station, and wired to the grinder pump station by the CONTRACTOR. An alarm device is required on the installation, there shall be NO EXCEPTIONS. The CONTRACTOR shall pole-mount the alarm device in a conspicuous location adjacent to the station, as per national and local codes. The alarm panel will be connected to the grinder pump station by a length of 6-conductor, 12-gauge, SJOW-type cable as shown on the Drawings. The power and alarm circuits must be on separate power circuits. The grinder pump station will be provided with a minimum of 25-feet of usable electrical supply cable outside the station, to connect to the alarm panel. This cable shall be provided with a FACTORY-INSTALLED EQD half to connect to the mating EQD half on the core.

3.04 START-UP AND FIELD TESTING

A. The Manufacturer shall provide the services of qualified factory trained technician(s) who shall inspect the placement and wiring of each station, perform field tests as specified herein, and instruct the OWNER's personnel in the operation and maintenance of the equipment before the station is accepted by the OWNER. All equipment and materials necessary to perform testing shall be the responsibility of the CONTRACTOR. This will include, as a minimum, a portable generator (if temporary power is required) and water in the wet well.

B. The services of a trained factory-authorized technician shall be provided for one working day of eight man-hours duration.

C. Upon completion of the installation, the authorized factory technician will perform the following test on the station:
   1. Make certain the discharge shut-off valve is fully open. This valve must not be closed when the pump is operating.
   2. Turn ON the alarm power circuit.
   3. Fill the wet well with water to a depth sufficient to verify the high-level alarm is operating. Shut off water.
   4. Turn ON pump power circuit. Initiate pump operation to verify automatic "on/ off" controls are operative. Pump should immediately turn ON. Within one-minute alarm light will turn OFF. Within three minutes the pump will turn OFF.

D. Upon completion of the start-up and testing, the Manufacturer shall submit to the ENGINEER the start-up authorization form describing the results of the tests performed for the grinder pump station. Final acceptance of the system will not occur until authorization forms have been received for the pump station installed and any installation deficiencies corrected.

END OF SECTION 11270

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SECTION 11271

DUPLEX DRAIN PUMP STATION

PART 1 – GENERAL

1.01 GENERAL DESCRIPTION

A. The MANUFACTURER shall furnish complete factory-built and tested one duplex drain pump station that meets low pH conditions and utilizes corrosion resistant wetwell, pump, and piping. The system shall consist of a magnetic drive vertical pump assembly, cpvc (or other suitable corrosion resistant piping), FRP wetwell, cover, electrical quick disconnect (NEMA 6P), pump removal harness, discharge assembly and shut-off valve, anti-siphon valve and check valve assembly, electrical alarm assembly, and all necessary internal wiring and controls.

1.02 SUBMITTALS

A. Submittals for the equipment specified herein shall be prepared and submitted to the ENGINEER in accordance with the provisions of Section 01300.

B. The MANUFACTURER shall supply copies of the operation and maintenance manuals in accordance with section 01730.

1.03 QUALIFICATIONS

A. The drain pump station, complete with all appurtenances, form an integral system, and as such, shall be supplied by one drain pump station manufacturer. The CONTRACTOR shall be responsible for the satisfactory operation of the entire system. The equipment specified shall be a product of a company experienced in the design and manufacture of drain pumps for specific use in low pressure sewage systems. The company shall submit detailed installation and user instructions for its product, submit evidence of an established service program including complete parts and service manuals, and be responsible for maintaining a continuing inventory of drain pump replacement parts.

B. The MANUFACTURER of the drain pump station shall be Iwaki American, Finish Thompson, or ENGINEER approved equal.

C. The equipment furnished hereunder shall be the product of a company experienced in the design and manufacture of drain pumps specifically designed for use in low pressure systems. All manufacturers proposing equipment for this project shall have at least 10 years of experience in the design and manufacture of units of identical size(s) and performance to the specified units. All manufacturers proposing equipment for this project must also provide evidence of successful installations of low pressure sewer systems utilizing drain pumps of like type to the drain pumps specified herein.

D. Attention is directed to the fact that the drawings and overall system design are based on a particular piece of equipment from a particular manufacturer. These specifications are intended to provide guidelines for standard equipment of a recognized manufacturer who already meets all the requirements of this specification.

1.04 OPERATING CONDITIONS

A. The pumps shall be capable of delivering a minimum of 35 GPM against a rated total dynamic head of 30 feet. The pump(s) must also be capable of operating at negative total dynamic head without overloading the motor. Under no conditions shall in-line piping or valving be allowed to create a false apparent head.
B. PH of influent water shall be a minimum of 2.
C. Influent invert shall be EL 4.0’
D. Station bottom shall be EL 0.0’
E. Station diameter shall be a minimum of 6’.
F. Discharge piping shall be 2” HDPE. Manifold piping may be CPVC or other material suitable for corrosive environments.

1.05 WARRANTY

A. The drain pump MANUFACTURER shall provide a part(s) and labor warranty on the complete station and accessories, including, but not limited to, panel and redundant check valve, for a period of 60 months after substantial completion. Any manufacturing defects found during the warranty period will be reported to the Manufacturer by the OWNER and will be corrected by the Manufacturer at no cost to the OWNER.

B. The equipment shall be warranted to be free from defects in workmanship, design and materials. If any part of the equipment should fail during the warranty period, it shall be replaced in the machine(s) and the unit(s) restored to service at no expense to the OWNER.

C. The MANUFACTURER’S warranty period shall run concurrently with the CONTRACTOR’S warranty period. No exception to this provision shall be allowed.

PART 2 – PRODUCTS

2.01 PUMP

A. Each pump shall be a custom-designed, integral, vertical rotor, motor driven, water handling pump of the type that is suitable to handle a fluid stream of pH of 2.

2.02 LAYOUT

A. The pumps shall be isolated from the wetwell to prevent corrosion from affecting the motor.

B. The station shall accommodate low pH odor control effluent with a vertical configuration. These requirements shall be accomplished by the following, in conjunction with the pump:
   1. The pump shall be positioned in such a way that liquids are fed in an upward flow direction.

2. The maximum flow rate through the valve assemby must not exceed eight feet per second or be less than 2 feet per second. This is a critical design element to prevent pipe issues.
3. The design of the station is to operate on a N+1 basis with pumps alternating between cycles.

C. The station shall be capable of reducing all components in normal odor control effluent, including a reasonable amount of “foreign objects,” such as biofilm.

2.03 ELECTRIC MOTOR

A. As a maximum, the motor shall be a maximum 2 HP, 208 Volt 60 Hertz, three phase, capacitor start, ball bearing, air-cooled induction type with a low starting current not to exceed 30 amperes and high starting torque of 8.4 foot pounds. Inherent protection against running overloads or locked rotor conditions for the pump motor shall be provided by the use of an automatic reset, integral thermal overload protector incorporated into the motor. This motor protector combination shall have been specifically investigated and listed by Underwriters Laboratories, Inc., for the application. Non-capacitor start motors or permanent split capacitor motors will not be accepted because of their reduced starting torque and consequent diminished grinding capability. To reduce the potential of environmental concerns, the expense of handling and disposing oil, and the associated maintenance costs, oil-filled motors will not be accepted.
   1. Should a different voltage be required, it will be the CONTRACTOR’s responsibility to coordinate and provide a transformer and related equipment to result in a functional system.
   2. Motor shall be protected against environmental damage and shall be weatherproof.

2.04 MECHANICAL SEAL

A. The pump shall be protected against motor damage through the use of a magnetic drive or suitable seal assembly.

2.05 WET WELL

A. The wet well shall be made of fiberglass reinforced plastic (FRP) of a grade selected for environmental stress cracking resistance. Corrugated sections are to be made of a double wall construction with the internal wall being generally smooth to promote scouring. Corrugations of outside wall are to be of a minimum amplitude of 1 1/2-inch to provide necessary transverse stiffness.

B. Any incidental sections of a single wall construction are to be a minimum 0.250 inch thick. All seams created during wet well construction are to be thermally welded and factory tested for leak tightness. Wet well wall and bottom must withstand the pressure exerted by saturated soil loading at maximum burial depth. All station components must function normally when exposed to maximum external

soil and hydrostatic pressure. The wet well shall be bedding and backfilled in accordance with Division 2 and the geotechnical report.

C. The wet well shall be furnished with field-installed EPDM inlet grommets to accept a 4-inch Sch 40 DWV pipe and a 1-1/2-inch Sch 80 PVC pipe or 2" HDPE pipe from the sump pump discharge. These connection locations shall be coordinated between the CONTRACTOR per the drawings. Wet well dimensions and capacities shall be as shown on the Drawings.

D. The wet well shall include a lockable cover assembly providing low profile mounting and watertight capability. Access way design and construction shall facilitate field adjustment of station height in increments of 4-inch or less without the use of any adhesives or sealants requiring cure time before installation can be completed.

E. All penetrations shall be completely sealed and leak tested.

2.06 DISCHARGE HOSE AND DISCONNECT/ VALVE

A. All discharge fittings and piping shall be constructed of HDPE, polypropylene, EPDM or PVC. The discharge hose assembly shall include a shut-off valve rated for 200 psi WOG and a quick disconnect feature to simplify installation and pump removal. The bulkhead penetration shall be factory installed and warranted by the manufacturer to be watertight.

2.07 ANTI-SIPHON VALVE

A. The pump discharge shall be equipped with a factory-installed, gravity-operated, flapper-type integral anti-siphon valve built into the discharge assembly. Moving parts will be made of fabric-reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength.

B. A nonmetallic hinge shall be an integral part of the flapper assembly, providing a maximum degree of freedom to ensure proper operation even at a very low pressure. The valve body shall be injection-molded from a glass-filled thermoplastic resin. Holes or ports in the discharge piping are not acceptable anti-siphon devices due to their tendency to clog from the solids in the slurry being pumped.

2.08 CHECK VALVE

A. The pump discharge shall be equipped with a factory-installed, gravity operated, flapper-type integral check valve built into the discharge assembly. The check valve will provide a full-ported passageway when open and shall introduce a friction loss of less than six inches of water at maximum rated flow. Moving parts will be made of a suitable material to accommodate low pH and a fabric reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A nonmetallic hinge shall be an integral part of the flapper assembly providing a maximum degree of freedom to assure seating even at a

very low back pressure. The valve body shall be an injection molded part made of glass filled PVC.

B. The drain pump installation shall also include one separate check valve of the type detailed in this section for installation in the discharge pipe.

2.09 WET WELL VENT

A. A vent shall be installed in the wet well cover. The vent shall consist of a 2-inch FRP threaded mounting flange, 2-inch FRP nipple, and a Wager 2100 mushroom check valve. The top shall be tapped and mounting flange connected to the lid per the wet well MANUFACTURER recommendations.

2.10 CORE UNIT

A. The drain pump station shall have an easily removable core assembly containing pump, motor, drain, all motor controls, check valve, anti-siphon valve, electrical quick disconnect and wiring. The watertight integrity of the core unit shall be established by 100 percent factory test at a minimum of five PSIG.

2.11 CONTROLS

A. All necessary controls, including motor and level controls, shall be located in the top housing of the core unit. The top housing will be attached with stainless steel fasteners.

B. Non-fouling wastewater level controls for controlling pump operation shall be accomplished by monitoring the pressure changes in an integral air column connected to a pressure switch. The level detection device shall have no moving parts in direct contact with the wastewater. High-level sensing will be accomplished in the manner detailed above by a separate air-bell sensor and pressure switch of the same type. Closure of the high-level sensing device will energize an alarm circuit as well as a redundant pump-on circuit. For increased reliability, pump ON/ OFF and high-level alarm functions shall not be controlled by the same switch. Float switches of any kind, including float trees, will not be accepted due to the periodic need to maintain (rinsing, cleaning) such devices.

C. To assure reliable operation of the pressure switches, each core shall be equipped with a breather assembly, complete with a suitable means to prevent accidental entry of water into the motor compartment. The drain pump will be furnished with a 6-conductor, 12-gauge, type SJOW cable, pre-wired and watertight to meet UL requirements with a FACTORY-INSTALLED NEMA 6P EQD half attached to it.

2.12 CONTROL PANEL

A. The drain pump station shall include a corrosion-proof, thermoplastic polyester NEMA 4X, UL-listed control panel suitable for wall mounting. The control panel shall be designated as VCP-630. The enclosure shall include a hinged, lockable

cover with padlock, preventing access to electrical components, and creating a secured safety front to allow access only to authorized personnel.

B. The control panel shall contain two 15-amp, 3 pole circuit breakers for the pump core's power circuit and one 15-amp single-pole circuit breaker for the alarm circuit. The panel shall contain a push-to-run feature, an internal run indicator, and a complete alarm circuit. All circuit boards in the control panel are to be protected with a conformal coating on both sides and the AC power circuit shall include an auto resetting fuse.

C. The control panel shall include the following features: external audible and visual alarm; push-to-run switch; push-to-silence switch; redundant pump start; and high-level alarm capability. When the pump and alarm breakers are on, the alarm sequence is to be as follows:
   1. When liquid level in the sewage wet well rises above the alarm level, audible and visual alarms are activated.
   2. The audible alarm may be silenced by means of the externally mounted, push-to-silence button.
   3. Visual alarm remains illuminated until the sewage level in the wet-well drops below the "off" setting of the alarm pressure switch.
   4. Service equipment/ main service disconnect breaker – A separate internal breaker, rated and approved for use as "service equipment," which also acts as a main service disconnect of the drain pump station, shall be provided.
   5. Run-time/ hour Meter – A run-time or hour meter shall be provided to display the total run-time or operation time for the pump core.

D. The visual alarm lamp shall be inside a red, oblong lens at least 3.75-inch L x 2.38-inch W x 1.5-inch H. Visual alarm shall be mounted to the top of the enclosure in such a manner as to maintain the NEMA 4X rating. The audible alarm shall be externally mounted on the bottom of the enclosure, capable of 93 dB @ 2 feet. The audible alarm shall be capable of being deactivated by depressing a push-type switch that is encapsulated in a weatherproof silicone boot and mounted on the bottom of the enclosure (push-to-silence button).

E. The entire control panel shall be listed by Underwriters Laboratories, Inc.

F. Drain pump run status, wet well levels, and system fault status shall be transmitted to the main control panel SCP-1.

2.13 SERVICEABILITY

A. The drain pump core unit shall have two lifting hooks, complete with nylon lift-out harness, to facilitate easy core removal when necessary. All mechanical and electrical connections must provide easy disconnect capability for core unit removal and installation. A push to run feature will be provided for field trouble shooting. All motor control components shall be mounted on a readily replaceable bracket for ease of field service.

2.14 OSHA CONFINED SPACE

A. All maintenance tasks for the drain pump station must be possible without entry into the drain pump station (as per OSHA 1910.146 Permit-required confined spaces). *"Entry means the action by which a person passes through an opening into a permit-required confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space."*

2.15 SAFETY

A. The drain pump shall be free from electrical and fire hazards as required in a residential environment. As evidence of compliance with this requirement, the completely assembled and wired drain pump station in its tank shall be listed by Underwriters Laboratories, Inc., to be safe and appropriate for the intended use. UL listing of components of the station or third-party testing to UL standard will not be accepted.

B. The drain pump shall meet accepted standards for plumbing equipment for use in or near residences, shall be free from objectionable noise, odor, or health hazards, and shall have been tested by an independent laboratory to certify its capability to perform as specified in either individual or low pressure sewer system applications. As evidence of compliance with this requirement, the drain pump shall bear the National Sanitation Foundation seal. Third-party testing to NSF standards will not be accepted.

PART 3 – EXECUTION

3.01 FACTORY TEST

A. The drain pump shall be submerged and operated for five minutes (minimum). Included in this procedure will be the testing of all ancillary components such as, the anti-siphon valve, check valve, discharge line and each unit's dedicated level and motor controls. All factory tests shall incorporate each of the above listed items. Actual appurtenances and controls which will be installed in the field shall be particular to the tested pump only. A common set of appurtenances and controls for all pumps will not be acceptable. Certified test results shall be available upon request showing the operation of the drain pump at two different points on its curve, with the maximum pressure no less than 60 psi.

B. Completed wetwell shall be factory leak tested to assure the integrity of all joints, seams and penetrations.

3.02 DELIVERY

A. The drain pump unit shall be delivered to the job site, 100 percent completely assembled, including testing, ready for installation. Drain pump station will be individually mounted on wooden pallet. Drain pump core will be shipped in a separate container and is only required to be installed in the basin.

3.03 INSTALLATION

A. Earth excavation and backfill are specified in Division 2 of these Specifications, but are also to be done as a part of the work under this section, including any necessary sheeting and bracing. The CONTRACTOR shall be responsible for handling ground water to provide a firm, dry subgrade for the structure, and shall guard against flotation or other damage resulting from general ground water or flooding. The drain pump station shall not be set into the excavation until the installation procedures and excavation have been approved by the ENGINEER. Also refer to the geotechnical report.

B. Remove packing material. User instructions MUST be given to the OWNER. Hardware supplied with the unit, if required, will be used at installation. The basin may not be dropped, rolled or laid on its side at any time for any reason.

C. Installation shall be accomplished so that 1-inch to 6-inch of access way extends above the finished grade line. The finished grade shall slope away from the unit. The diameter of the hole must be large enough to allow for the concrete anchor.

D. A 6-inch inch (minimum) layer of naturally rounded, clean and free-flowing aggregate, No. 57 stone, shall be used as bedding material under the unit. A concrete anti-flotation collar, sized according to the manufacturer's instructions, shall be required and shall be precast to the drain pump or poured in place. The drain pump station with its precast anti-flotation collar shall have a minimum of three lifting eyes for loading and unloading purposes. The unit shall be leveled, and filled with water, to the bottom of the inlet, to help prevent the unit from shifting while the concrete is being poured and set. The concrete must be manually vibrated to ensure there are no voids. If it is necessary to pour the concrete to a level higher than the inlet piping, an 8-inch sleeve is required over the inlet prior to the concrete being poured.

E. The electrical enclosure shall be furnished, pole-mounted adjacent to the station, and wired to the drain pump station by the CONTRACTOR. An alarm device is required on the installation, there shall be NO EXCEPTIONS. The CONTRACTOR shall pole-mount the alarm device in a conspicuous location adjacent to the station, as per national and local codes. The alarm panel will be connected to the drain pump station by a length of 6-conductor, 12-gauge, SJOW-type cable as shown on the Drawings. The power and alarm circuits must be on separate power circuits. The drain pump station will be provided with a minimum of 25-feet of usable electrical supply cable outside the station, to connect to the alarm panel. This cable shall be provided with a FACTORY-INSTALLED EQD half to connect to the mating EQD half on the core.

3.04 START-UP AND FIELD TESTING

A. The Manufacturer shall provide the services of qualified factory trained technician(s) who shall inspect the placement and wiring of each station, perform field tests as specified herein, and instruct the OWNER's personnel in the operation and maintenance of the equipment before the station is accepted by the

OWNER. All equipment and materials necessary to perform testing shall be the responsibility of the CONTRACTOR. This will include, as a minimum, a portable generator (if temporary power is required) and water in the wet well.

B. The services of a trained factory-authorized technician shall be provided for one working day of eight man-hours duration.

C. Upon completion of the installation, the authorized factory technician will perform the following test on the station:
   1. Make certain the discharge shut-off valve is fully open. This valve must not be closed when the pump is operating.
   2. Turn ON the alarm power circuit.
   3. Fill the wet well with water to a depth sufficient to verify the high-level alarm is operating. Shut off water.
   4. Turn ON pump power circuit. Initiate pump operation to verify automatic “on/ off” controls are operative. Pump should immediately turn ON. Within one-minute alarm light will turn OFF. Within three minutes the pump will turn OFF.

D. Upon completion of the start-up and testing, the Manufacturer shall submit to the ENGINEER the start-up authorization form describing the results of the tests performed for the drain pump station. Final acceptance of the system will not occur until authorization forms have been received for the pump station installed and any installation deficiencies corrected.

END OF SECTION 11270

SECTION 11680

DEGASIFIER AND ODOR CONTROL SYSTEM

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to install and test the degasifier vessel, biotrickling filter odor control system, and exhaust fan, and complete with all appurtenances as specified herein.
   1. Manufacturer shall furnish degasifier vessel with integral mist eliminator and media support, liquid distribution system, vessel transition dome, water holding tank, and all required access points and nozzles for a fully functioning system.
   2. Manufacturer shall furnish biotrickling filter equipment with integral re-circulation sump, mist eliminator, discharge stack, all required access hatches and nozzles, including exhaust fan, filter vessel, media, nutrient addition system, water addition system and control panel with VFD, instrumentation and controls prewired for a fully functioning, skid mounted, system.
   3. Manufacturer shall provide Shop drawings and Operation and Maintenance manuals.
   4. Manufacturer shall provide Startup and performance acceptance testing services as specified herein.
   5. Placement, installation, bolting to the pad and connection of ductwork, water piping, drainage piping and power provided by CONTRACTOR.

B. The System shall comprise the following major components:
   1. One single dual laminate degasifier vessel for treatment of membrane permeate. The system shall consist of a degasifier vessel with weir and trough liquid distribution system and header, multi-beam gas injection packing support, packed tower, forced draft fan, interconnecting duct work between the fan and the vessel, local read instrumentation and all required appurtenances for a complete operating system.
   2. One single-stage biotrickling filter vessel. The FRP vessel shall be skid mounted and house both biological and polishing stages of treatment in a single vessel. The synthetic media zone shall house the plastic, structured synthetic media and a single water/nutrient injection spray system.
   3. Structured, engineered, synthetic media to optimize mass transfer and facilitate the growth of bacteria necessary for biological oxidation of odorous compounds. The media bed shall be uniform and structured throughout and made entirely of a plastic, synthetic, non-reactive material.
   4. To comply with NFPA 820, the electrical and water control panels shall be mounted a minimum of 3 feet from any potential leak source. Any electrical components or instrumentation located within the Class 1, Div. 2 classified area, shall be rated accordingly.
   5. A UL, factory-labeled electrical control panel housing a single Programmable Logic Controller (PLC) system, VFD and other components required for the control and monitoring of the System.
   6. An Irrigation Water Control System (IWCS) that includes all the components necessary for the control and monitoring of the media irrigation system.
   7. Exhaust fan to move the odorous air from the source and be able to compensate for all pressure losses at the design airflow.

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C. All materials, products, and devices shall be new and unused.

1.02 RELATED WORK

A. Division 16 for electrical and instrumentation requirements.

1.03 CONTRACTOR RESPONSIBILITY

A. Installation of all Manufacturer supplied equipment components, which includes among others, placement and bolting of the vessels, skids and ancillary equipment to the concrete pad, connection of ductwork, water piping, drainage piping, and power and control wiring, all in accordance with the Manufacturer's installation instructions. Contractor shall provide all equipment offloading, temporary storage, and placement.

B. Supply of all odorous air ductwork including flex connectors leading to the inlet of the vessels.

C. Site preparation and clearing.

D. Construction of concrete equipment pad for placement of the system vessel, fans, control panels, and supply of all System anchor bolts.

E. External interconnecting water piping and drain piping to and from the vessels, water boxes and other fluid equipment including any piping supports, drainage traps and insulation. Install all ductwork hardware, gaskets, flexible connectors, dampers, for a complete and operational system.

F. Power supply to the electrical control panel, water supply to the irrigation water control system, and water drain line from the filter drain sumps.

G. Installation of any additional items as noted on the contract drawings. Provide labor for assembly of sound enclosures, if applicable.

H. Heat tracing and insulation of any air ductwork and/or water pipes as required by this Specification or elsewhere in the Contract Documents.

I. All media shall be stored onsite prior to installation. Contractor shall be required to remove vessel access covers, install and distribute media evenly across the vessel, assemble media irrigation system and reinstall covers.

J. Temporary piping for startup of the System.

1.04 PROCESS DESCRIPTION

A. The membrane permeate shall enter the degasifier vessel from the top and trickle down through the packed tower. The forced draft fan shall blow ambient air into the bottom of the vessel and upward through the packed tower for a counter-flow configuration. The air shall "strip" the dissolved hydrogen sulfide from the membrane

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permeate and exit through the top of the vessel while the treated water exits through the bottom of the vessel.

B. The odor control system shall remove hydrogen sulfide, organic reduced sulfur compounds (RSCs) and other odorous compounds from the foul air stream using a biotrickling filter operating in a counter-current fashion. Co-current systems shall not be allowed. The system shall be operated under vacuum with the blowers mounted prior to the treatment stages.

C. The foul air shall enter the biotrickling filter at the bottom and flow upward through the biotrickling filter media layers. The media bed shall be intermittently irrigated from above using suitable reclaimed plant effluent or potable water, and a sump shall be provided to collect the drain water at the bottom of the reactor. The hydrogen sulfide is oxidized by the autotrophic bacteria resident on the lower media layer(s). As the foul air passes through the upper media layer (s), the resident heterotrophic bacteria will oxidize other organic odorous compounds.

D. The drain water from the system will pass from the sump in the bottom of the reactor vessels and be piped to a discharge point as detailed on the Contract drawings.

1.05 REFERENCES

A. The following is a list of standards which may be referenced in this section:
1. ASTM C582: “Standard Specification for Contact-Molded Reinforced Thermosetting Plastic Laminates for Corrosion-Resistant Equipment.”
2. ASTM D790: “Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insultation Materials.”
3. ASTM E679: “Standard Practice of Odor and Taste Thresholds By a Forced-Choice Ascending Concentration Series Method of Limits”.
4. ASTM D-2563: “Recommended Practice for Classifying Visual Defects in Glass Reinforced Plastic Laminate Parts”.
5. ASTM D-2583: “Standard Test Method for Indentation Hardness of Rigid Plastics by Means of Barcol Impressor”.
6. ASTM D3299: “Standard Specification for Filament-Wound Glass Fiber Reinforced Thermoset Resin Corrosion-Resistant Tanks.”
7. ASTM D4097: “Standard Specifications for Contact Molded Glass Fiber Reinforced Thermoset Resin Chemical Resistant Tanks.”
8. ASTM D4167: “Standard Specification for Fiber-Reinforced Plastic Fans and Blowers.”
9. American National Standards Institute (ANSI).
10. American Society of Mechanical ENGINEERs (ASME).
11. Institute of Electrical and Electronic ENGINEERs (IEEE).
12. National Electrical Manufacturers Association (NEMA).
13. National Electrical Code (NEC).
14. National Fire Protection Agency (NFPA).
15. National Bureau of Standards (NBS).
16. Underwriters Laboratories (UL).
17. American Society for Testing and Materials (ASTM).

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1.06 SUBMITTALS

A. Shop drawings and literature describing the equipment shall be submitted to ENGINEER for evaluation and approval. Fabrication of the degassifier and odor control system shall not begin until ENGINEER and OWNER have given written approval. If the selected Manufacturer's equipment layout, configuration, and/or piping requires changes from what is shown on the Drawings, it is the responsibility of the Manufacturer to submit all changes with the shop drawings and modify the drawings accordingly at no additional cost to the OWNER or ENGINEER.

B. Manufacturer shall coordinate vessel bulk head fitting locations appropriately for the configuration of the site as shown on the Drawings. Detailed construction drawings shall show the location of all bulk head fittings and shall be provided for review in the shop drawings. CONTRACTOR shall coordinate this submittal with the pipe layout submittal as noted on the Drawings.

C. The Manufacturer shall submit information as required to show complete compliance with these specifications. At a minimum this information should include the following:
   1. Manufacturer's catalog/data sheets and descriptive literature for each piece of equipment supplied including model numbers.
   2. Media material, total depth, and number of media sections.
   3. Nutrient storage and feed system, recirculation pump, blower performance curves, blower motor (manufacturer, model, bearing type, horsepower,, load efficiency, current and dimensions), and operating parameters.
   4. Technical data on each major piece of equipment including weights of all items greater than 200 Lbs.
   5. Guarantee from the manufacturer that the total system noise shall not exceed Q=2, 75 dBA at 3' from the system blower.
   6. Detailed bill of material complete with material of construction.
   7. Dimensional drawings showing elevation and plan views of the System and all applicable connections.
   8. Process and Instrumentation Diagram (P&ID) showing all main equipment components, flow rates and instrumentation.
   9. Process control narrative and wiring diagrams.
   10. Equipment offloading and installation instructions with sufficient detail to allow the CONTRACTOR to complete the mechanical and electrical installation of all System components.
   11. Annual utility, media and nutrient usage calculations (if applicable).
   12. Statement of Manufacturer's Warranty.
   13. Information on hazards associated with the System and appropriate safety precautions, including applicable Material Safety Data Sheets (MSDS).

D. The Manufacturer shall submit the following information, as a minimum, for the Operation and Maintenance Manuals.
   1. As-built dimensional drawings showing plan and elevation views of the System and all applicable connections.
   2. As-built Process and Instrumentation Diagrams (P&IDs).
   3. Detailed bill of material along with specification of System components and materials of construction. The list to include the make, model number and

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descriptive literature of all items furnished by the Manufacturer. Include Manufacturer's recommended spare parts list.

4. Performance data for the degasifier, biotrickling system, and exhaust fan to include curves showing capacity, pressure, horsepower demand and efficiency over the entire operating range, including blower manufacturer's descriptive literature and blower model number(s).
5. Special precautions for any components or materials associated with the System and its operation that should be subject to particular safety precautions, including MSDS.
6. Manufacturer's Service Department contact information and service order form.
7. Statement of Manufacturer's Warranty.
8. System startup and restart instructions.
9. Special maintenance procedures, including recommended weekly, monthly and annual preventative maintenance requirements.
10. Troubleshooting guide.
11. Individual Operation and Maintenance instructions for all major system components.

E. Manufacturer shall submit calculations indicating the basis of design for the system. These must demonstrate that the equipment is structurally sound to withstand internal hydrostatic forces and external wind load forces and that the system will perform as specified. Submit complete design calculations for the degassifier and odor control system. The design calculations shall be sealed by a Registered Professional ENGINEER in the State of Florida. These calculations must be provided for final approval of the system. Calculations that are not signed and sealed should be provided with the initial shop drawing for validation prior to submitting signed and sealed copies after shop drawing review.

F. Submit the performance guarantee as per the requirements herein and sample warranty for the system within the initial shop drawing.

G. Manufacturer shall furnish a list of recommended spare parts for each piece of equipment in the scope of supply.

H. Results of all performance testing procedures and results.

1.07 SHIPPING, DELIVERY, STORAGE & HANDLING

A. All equipment and materials shall be properly protected such that no damage will occur from the time of shipment until the time of installation. Electrical and ancillary equipment shall be stored in a climate controlled building.

B. All exposed openings shall be protected to prevent entrance of debris, moisture or water during transportation and storage.

C. CONTRACTOR shall be responsible for offloading all shipped equipment and shall inspect all equipment upon arrival. CONTRACTOR shall notify the Manufacturer

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within 24 hours of any damage to equipment or surface finish due to shipping.

D. CONTRACTOR shall store all equipment such that, for the duration of the storage period, there will be no deterioration in equipment appearance or performance. Manufacturer shall supply detailed storage instructions, as necessary, at the time of shipment.

1.08 WARRANTY

A. The degasifier and biotrickling filter Manufacturer shall warrant that the equipment supplied meets these specifications and the performances detailed in Section 2.04 and that it is new and unused, free from defects in materials and/or workmanship. This warranty shall be for 18 months from equipment delivery to the job site or 12 months from equipment substantial completion, whichever comes first. In the event that it is determined that a defect exists, at the Manufacturer's discretion, the Manufacturer shall repair or replace the defective components, provided that any such defect was not the result of misuse of the component by the OWNER or his agents.

B. The degasifier and biotrickling filter Manufacturer shall warrant the synthetic media against defects in material and workmanship for ten (10) years from equipment startup. In the event that it is determined that a defect exists, at the Manufacturer's discretion, the Manufacturer shall repair or replace the defective components, provided that any such defect was not the result of misuse of the component by the OWNER or his agents.

PART 2 - PRODUCTS

2.01 GENERAL

A. The degasifier and odor control equipment supplied under this section must be provided by a single Manufacturer who will be solely responsible for the design, delivery and performance of the system. The equipment must be new and unused and meet the detailed specifications and warranty requirements stated herein.

2.02 QUALITY ASSURANCE

A. The System Manufacturer is responsible for the coordination of all equipment specified herein. Systems shall be as manufactured by Biorem or BioAir Solutions, LLC. Or pre-approved manufacturers only. Unnamed manufacturers will not be considered after the bid.

A. Experience Requirements
   1. The System Manufacturer shall be experienced in the design, manufacture, installation and operation of structured synthetic media biotrickling filters and degasifiers designed to remove hydrogen sulfide and organic RSCs from municipal water odor sources. The System Manufacturer shall have a minimum of ten (10) years of experience producing substantially similar

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equipment and shall show evidence of at least thirty (30) systems in satisfactory operation for at least five (5) years in the United States.

2. Any manufacturer whose primary business is FRP manufacturing will not be accepted as a supplier for the odor control system specified herein.

B. Substitution

1. Any substitutions or deviations in equipment or arrangement from that shown on the drawings or specified herein shall be the responsibility of the CONTRACTOR. Any deviation must be accompanied by detailed structural, mechanical and electrical drawings and additional supporting data for review by the OWNER and the OWNER's ENGINEER and must be stamped and certified by a registered Professional ENGINEER (PE) licensed in the State of Florida.
2. All costs associated with the review of substitutions or deviations, and costs to the ENGINEER or OWNER associated with project drawing changes as a result of approval of the substitution, shall be borne by the CONTRACTOR. There shall be no additional costs to the OWNER due to substitutions or deviations.

C. Acceptable Manufacturers

1. Where a Manufacturer's standard equipment name is used in these specifications, the intent is to establish a minimum standard in terms of equipment quality, performance, functionality and experience. Substitutions as detailed above must be pre-approved by the ENGINEER prior to bidding.
2. Request for pre-approval must be received in writing 21 days prior to the bid opening date and must include the following supporting documentation and information:
    a. Provide project specific drawings showing arrangement of degasifier and biotrickling filter, blower, electrical and water control panels.
    b. Provide project specific Process and Instrumentation Diagram (P&IDs)
    c. Calculations showing cost of operation – power consumption, water consumption, nutrient consumption, expected degasifier and biotrickling media life, carbon life calculations, etc.
    d. A list of ten (10) similar installations with contact names and phone numbers, length of time in operation and volume of air being treated.
    e. Performance data for at least two (2) installations detailing equipment capacity, length of time in service, H_2S removal %, media volume and type and Empty Bed Residence Time (EBRT). Data set for each installation shall be for a minimum of 1 week. Manufacturers that are unable to provide such performance data will not be considered.
    f. Local service center details.
    g. Qualifications of key individuals
    h. Company financial documentation – D&B report, Bonding Capacity, etc.

3. In addition, the following may be included to aid the evaluation process:
    a. Cut-sheets, bulletins, company brochures, etc.
    b. Testimonial or recommendation letters from previous customers
    c. Published Industry technical papers / bulletins

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2.03 OPERATING CONDITIONS

A. The System shall be suitable to treat air coming from a continuous supply from the odor source. All equipment must be suited to the operating conditions to which it will be subjected and the various compounds/substances with which it will reasonably be expected to come into contact. The operating conditions, at a minimum, include the following:

Duty	Continuous (air supply and odor source)
Location	Outdoors
Inlet air temperature	55 – 100°F
Inlet air relative humidity	60 - 100%
Contaminants	Hydrogen sulfide, organic RSC's, ammonia, methyl mercaptan and sulfuric acid.

2.04 DESIGN REQUIREMENTS

A. At a minimum, the System shall treat the following and meet the following minimum performance criteria:

Inlet Water Quality

Parameter	Value
Design Liquid Flow Rate	1.5 MGD
Air Flow Rate	3,000 CFM
pH	6.0
Hydrogen Sulfide	4.5 mg/L
Minimum Air/Water Ratio	20:1
Minimum Air Velocity	75 fpm
BTF Inlet Air Wuality from Degasifier	
Flow rate	3,000 CFM
Temperature	50-90 °F
Relative Humidity	>50% RH
Average H_2S Concentration	149 ppm

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System Configuration and Common Utilities

Parameter	Value
System Configuration	(1) Degasifier Vessel followed by Biotrickling filter (BTF)
Estimated BTF Water Consumption	7,000 gpd
Electrical Supply Required	460V / 3PH / 60Hz
Estimated System Footprint	40 ft x 15 ft

Vessel Design

Parameter	Degasifier	Biotrickling Filter
Number of Vessels	1	1
Vessel Dimensions	7 ft diameter : 24 ft height	7 ft diameter : 28 ft height
Empty Weight	6,000 lbs	6,400 lbs
Operating Weight	28,000 lbs	40,000 lbs
EBRT	10’ media depth	15 seconds
Water Recirculation Rate	N/A	30 gpm
Mass Transfer Packing Depth	19.5 ft	19.5 ft

Three Phase Equipment

Parameter	Value
Forced Draft Fan Quantity	1
Forced Draft Fan Capacity	4,500 CFM @ 8.0 inWC
Forced Draft Fan Motor Size	10 HP each

B. Performance requirements (Biological Stage):
   1. The system shall have passed the performance test if either one of the following conditions is true:
      a. H_2S removal efficiency is ≥ 88% for inlet air H2S concentrations ≥ 50 ppmv but ≤ 300 ppmv
      b. Outlet H_2S concentration is ≤ 0.5 ppmv for inlet air H2S concentrations ≤ 50 ppmv

C. Performance requirements (Total System):
   1. The system shall have passed the performance test if either one of the following conditions is true for both H_2S and odor removal:
      a. H_2S removal efficiency is ≥ 88% for inlet air H2S concentrations ≥ 10 ppmv but ≤ 300 ppmv
      b. Outlet H_2S concentration is ≤ 0.1 ppmv for inlet air H2S concentrations ≤ 10 ppmv
      c. Odor removal efficiency is ≥ 95% for inlet air odor concentrations ≥ 4,000 D/T* but ≤ 60,000 ppmv
      d. Outlet odor concentration is ≤ 200 D/T for inlet air odor concentrations ≤ 4,000 D/T

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2.05 SYSTEM COMPONENTS

A. Degassifier
   1. The vessel shall be fabricated from FRP with an inner corrosion barrier of NSF-61 certified PVC. PVC lining shall be constructed from rigid PVC sheet with a minimum thickness of 3/16 in. It shall be hot gas welded or butt fusion welded at all seams and joints. The exterior FRP overlay shall be applied by hand lay-up or chopped spray techniques, the resin shall be an isophthalic polyester resin. All surfaces shall be finished so as to obtain complete cure of the resin without air inhibition. The finished laminate shall be as free as commercially practicable from visual defects such as foreign inclusions, dry spots, air bubbles, pinholes and pimples. The vessels shall conform to the resin manufacturer's minimum standard for Barcol hardness.
   2. Reinforcing materials shall be commercial grade e-glass fiber containing a coupling agent to produce a suitable bond with the resin used. Ultravoilet absorbers shall be added to the exterior surface for improved weather resistance. Insulated tanks, where applicable, shall have a light gray pigmented exterior gelcoat layer.
   3. All necessary access hatches, nozzles and other attachments. Vessel connection flanges shall be compatible with connecting piping and ductwork. All bolts and fasteners shall be minimum 316 stainless steel hardware and EPDM strapping. All gaskets shall be NSF 61 certified EPDM.
   4. The vessel shall be provided with 316 stainless steel hold down lugs to account for all anticipated loads to comply with local wind code requirements.
   5. Manways shall be provided for loading and unloading of the packed tower and for maintenance of the liquid distribution and packing support system. Manways shall be a minimum of 24-inch diameter with bolted flanged covers.

B. Weir and Trough Distribution System
   1. System shall consist of a weir and trough with header to distribute flow of the membrane permeate over the packed tower. System shall be designed for minimum and maximum flow conditions and shall ensure no dry spots will occur on the surface of the packing. System shall be constructed of NSF 1 certified PVC.
   2. Packing support shall be multi-beam gas injection packing support and be constructed of FRP grating with NSF 61 certified resin.

C. Media
   1. The synthetic structured media shall be a rolled media with engineered channels to resist fouling (or the preapproved equivalent), high porosity, chemically resistant, engineered synthetic porous material. Organic, carbon derived media, and/or non-synthetic inorganic media or adsorbent materials shall not be allowed.
   2. The media characteristics (available surface area, density, and pressure drop) shall be structured and uniform throughout the media bed. Random media types (chips, balls, cubes, etc.) shall not be allowed.
   3. Media shall resist compaction or swelling due to varying moisture levels and shall not degrade when subjected to low pH (i.e. pH<2) conditions.
   4. The uniform structure of the media shall minimize the potential for short

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circuiting and encourage a uniform water and airflow pattern over the entire media cross sectional area.

5. Sufficient media shall be provided to ensure the performance requirements listed in section 2.04 are met.

D. Irrigation System

1. Each reactor shall be configured with at least one (1) irrigation point which shall distribute the irrigation water evenly over the entire upper surface of the synthetic media layer.
2. Each irrigation system shall be tested by the Manufacturer and a certificate of conformity supplied with the shop drawings to show that the nozzle has been tested and meets the Manufacturers standards for uniform distribution.
3. The irrigation system shall be supplied with a nutrient addition system to provide the macro and micronutrients required by the bacteria for optimal metabolism of the odorous compounds being treated.

E. Control System

1. Electrical Control Panel (ECP)
   a. A single ECP shall control the fan, irrigation and, if applicable, the nutrient feed system. The ECP enclosure shall be NEMA 4X and constructed of 316 stainless steel or FRP and shall mounted >3’ from the vessel, blower and ductwork.
   b. The ECP shall house the necessary electronic components including an Allen Bradley Micro 820 PLC with LCD display for the control and monitoring of the irrigation system. The system shall be controlled by the PLC on the basis of time for the irrigation cycle and irrigation time and nutrient dose time shall be adjustable to sustain conditions appropriate to the activity of the bacteria. Dry contacts shall be provided for external notification of alarm status. Alarms, at a minimum, shall be provided for low irrigation water flow, high irrigation water flow, no nutrient flow (if applicable) and exhaust fan fail. Providing alarms on the basis of irrigation water pressure, in lieu of flow are not acceptable. There must be an allowance to manually open the irrigation spray valve (located in the WCP) for the purpose of routine maintenance checks but the valve should be normally closed. Variable frequency drives (VFD) shall be provided in the ECP for the control of the exhaust fan.
   c. The ECP shall require a single electrical connection of 480V/3Phase/60Hz. Transformers shall be provided as necessary for power and control voltages.
2. Irrigation Water Control Panel
   a. A single Water Control Panel (WCP) will provide for irrigation and shall include valves, motorized ball valves, strainers, instruments and piping for the control of the irrigation system and shall operate from control signals from the ECP.
   b. The WCP shall be 316 stainless steel NEMA 4X.
   c. The WCP shall allow for a single connection to either a potable water source or suitable final effluent plant water source.
   d. The WCP shall include the nutrient addition system, with metering pump

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nutrient storage vessel, and recirculation pumps.

F. Dampers (As required in the project plans)
   1. Flow Control Dampers shall be constructed of vinyl ester resin, of the single blade type complete with channel type frame, close fitting blade, full circumference blade stop, full length 316 stainless steel axle, and bearings. Dampers shall have the same inside dimensions as the connecting piping.
   2. Isolation Dampers shall be constructed of vinyl ester resin, of the single blade type complete with channel type frame, close fitting blade, neoprene or EPDM blade and Viton shaft seals, full length 316 stainless steel axle, and bearings. Each damper shall have the same inside dimensions as the connecting piping.

G. Exhaust Fan
   1. The exhaust fan shall be spark resistant FRP backward inclined or radial bladed centrifugal type designed for continuous service. The fan shall include a 316 stainless steel shaft and be equipped with a slip inlet connection. The fan will be manufactured by Universal Fan and Blower, Hartzell Air Movement or BIOREM approved equal.
   2. SOUND ENCLOSURE – A shell fabricated of FRP or 304 stainless steel to be one piece and be lowered over the exhaust fan. Enclosure shall include 2-inch thick sound absorbing foam (NRC level 0.9), explosion proof ventilation fan, integral silencers, access hatches or doors for fan maintenance with a minimum of 2-foot clearance around exhaust fan.
   3. MOTORS - Fan shall have a 3 phase/60Hz/460V, TEFC, 1800 RPM Motor with a service factor of 1.15. Motor bearings shall have a minimum L-10 life, as defined by AFBMA, of at least 40,000 hours (200,000 hours average life).
   4. BALANCING - Prior to shipment all fans shall be completely assembled and test run as a unit at the operating speed. Final balance of the completed fan assembly shall be taken by electronic equipment. Records of the vibration readings in the axial, vertical, and horizontal planes shall be maintained, and a written copy of this record shall be available upon request.
   5. Exhaust fan noise at 3’ from the System shall be less than 75 dBA, Q=2.

2.06 SPARE PARTS

A. At a minimum, the following spare parts shall be supplied with the equipment.
   1. One (1) nutrient pump rebuild kit

B. Spare parts shall be stored, by the CONTRACTOR, on site and shall be handed over to the OWNER at equipment handover.

PART 3 - EXECUTION

3.01 FACTORY ACCEPTANCE TEST

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A. Reactor Vessels
   1. Vessels shall be inspected prior to shipping for conformance to the following:
      a. Dimensions match those shown on submittal drawings and are within Manufacturer's specified tolerances.
      b. Flanges and connections between reactor parts fit securely without improper bending or stressing of parts.
      c. Damage or imperfections.
      d. Manufacturer shall provide airflow modeling results confirming uniform airflow distribution throughout the media.
      e. Manufacturer shall keep a record of the quality control document for each reactor vessel(s) that is available to the ENGINEER upon request.

B. Electrical Control Panel
   1. Electrical control panel shall be inspected prior to shipping for conformance to the following:
      a. NEMA rating according to Section 2.05D and bear the UL508 label.
      b. PLC program and HMI shall be tested for proper communication and functionality.
      c. PLC digital and analog inputs shall be electrically tested to ensure input recognition in the proper area of the PLC program.
      d. All wiring between panel components and terminal strips shall be checked for proper labeling and connection.

C. Irrigation Water Control Panel
   1. All water piping and/or other pre-installed piping shall be tested prior to shipping for conformance to the following:
      a. System shall have no leaks when subjected to a pressure test at 80 psi for a minimum of 1 hour.
      b. All installed instruments, sensors, pumps, actuated valves, and other electrical components shall be tested for proper operation.
      c. All wiring from terminal strips to all electrical components shall be tested to ensure proper wiring.

D. Spray nozzle
   1. Irrigation System shall be factory tested to ensure compliance with Manufacturer standards for uniform distribution.

3.02 INSTALLATION & EQUIPMENT START-UP

A. As far as is reasonably possible, all equipment should be pre-assembled prior to shipment, to minimize the need for on-site assembly.

B. Installation of all equipment will be conducted by the CONTRACTOR and must be in accordance with Manufacturer's written installation and start-up instructions and by workers experienced in the handling of vessels, electrical work, plumbing and instrumentation. The final installation must be certified by the Manufacturer as complete and correct.

C. The Manufacturer shall provide the CONTRACTOR with required clearances,

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tolerances and limitations, such as smoothness/flatness of concrete pad and shall be available to answer questions prior to and during the installation of the equipment. Contractor shall give the manufacturer 5 days' notice prior to media placement.

D. Once the installation has been certified by the Manufacturer, the CONTRACTOR, with assistance from the Manufacturer, shall start the System to begin the biological acclimation period. This start-up period shall take no longer than six (6) weeks but at any point during this start-up period, at the discretion and direction of the Manufacturer, the CONTRACTOR shall switch the system over to normal operation. Any minor re-piping or plumbing required will be clearly detailed in the Manufacturer's installation and start-up manual and will be performed by the CONTRACTOR.

E. Any special tools or materials required for this start-up/acclimation period shall be provided by the Manufacturer.

F. After satisfactory start-up and the corresponding switch over to normal operation, the CONTRACTOR shall, in the presence of the ENGINEER, conduct the performance test as detailed in section 3.04 below.

3.03 FIELD PAINTING & CORROSION PROTECTION

A. If painted surfaces are damaged during shipment, off-loading or installation, as long as the damage is surface only and in no way affects the integrity of the equipment or its ability to perform, these blemishes, scratches or other imperfections shall be touched up by the CONTRACTOR in accordance with instructions from the Manufacturer. Materials used shall be compatible with the original coating material in quality and color.

3.04 PERFORMANCE TESTING

A. Performance testing shall not commence until the Manufacturer and ENGINEER agree that they system has been satisfactorily started-up and sufficient time has been allowed for the acclimation of the bacteria. The Manufacturer shall provide nutrients for startup and testing.

B. After the System has been satisfactorily started-up and switched to normal operation, the CONTRACTOR shall, in the presence of the ENGINEER, demonstrate that the system will perform as specified in section 2.04 of this specification.

C. The CONTRACTOR shall provide the ENGINEER with a written test protocol and the performance test may not be conducted until the test protocol has been reviewed and approved by the ENGINEER.

D. The Manufacturer may be present during the performance test and, at its own discretion, may conduct a parallel performance test as long as it does not interfere with the performance test being conducted by the CONTRACTOR.

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E. The CONTRACTOR shall supply, install and operate all equipment, sensors and instrumentation required to complete the performance test.

F. H_2S Testing procedure
   1. Measure airflow into each unit and, if necessary, adjust to the design airflow to +/- 10%. Airflow may be witnessed by the ENGINEER and/or CONTRACTOR if desired. Airflow shall be measured at the beginning of the test period. The set position on the VFD(s) will be marked or noted. Airflow will not change as long as VFD(s) remain in position.
   2. Measure pressure drop across each vessel at beginning of test period.
   3. Measure temperature and relative humidity of the inlet, midpoint, outlet and ambient air.
   4. Performance test period to begin at a noted time and last for four (4) hours. H_2S data from the common inlet location and from the outlet of each odor control system will be measured and logged once every 10 minutes to demonstrate performance during test period.
      a. The inlet H_2S data will be logged with a pre-calibrated OdaLog gas data logger with appropriate range and accuracy for the inlet air stream (0-1000 ppmv or 0 - 200 ppmv range, 1 ppm display resolution or 0.0 - 50.0 ppmv range, 0.1 ppmv display resolution).
      b. The midpoint H_2S data will be logged with a pre-calibrated OdaLog gas data logger with appropriate range and accuracy for the midpoint air stream. (0.00 - 2.00 ppmv range, 0.01 ppmv display resolution or 0.0 - 50.0 ppmv range, 0.1 ppmv display resolution).
      c. The outlet H_2S data will be logged with a pre-calibrated OdaLog gas data logger with appropriate range and accuracy for the outlet air stream. (0.00 - 2.00 ppmv range, 0.01 ppmv display resolution or 0.0 - 50.0 ppmv range, 0.1 ppmv display resolution).

G. H_2S Acceptance criteria:
   1. The System's H_2S removal efficiency shall be determined by calculating the average inlet H_2S concentration and the average outlet H_2S concentration and using the following formula: H_2S removal efficiency (%) = (1 – (average outlet H_2S concentration/average inlet H_2S concentration)) x 100.
   2. The system shall have passed the H_2S performance test if the H_2S removal efficiency of the biological stage is 99% or more for inlet air H_2S concentrations ≥ 50 ppmv but ≤ 250 ppmv, or the average outlet air H_2S concentration is ≤ 0.5 ppmv, whichever is greater, and -
   3. The overall H_2S removal efficiency is 99.5% or more for inlet air H_2S concentrations ≥ 20 ppmv but ≤ 300 ppmv, or the average outlet air H_2S concentration is ≤ 0.5 ppmv, whichever is greater.
   4. In the event that the maximum H_2S concentration during the four (4) hour test period exceeds the maximum allowable H_2S concentration as listed in this Specification, the H_2S acceptance criteria shall not apply, and the system shall be considered to have passed the performance test.

H. Odor Testing procedure
   1. Measure airflow into each unit and, if necessary, adjust to the design airflow to +/- 10% of design flow. Airflow balancing may be witnessed by the ENGINEER

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and/or CONTRACTOR if desired. Airflow shall be measured at the beginning of the test period. The set position on the VFD(s) will be marked or noted. Airflow will not change as long as VFD(s) remain in position.

2. Measure pressure drop across vessel at beginning of test period.
3. Measure temperature and relative humidity of the inlet, outlet and ambient air.
4. Three (3) sets of air samples shall be collected for each of the two vessels, each set consisting of one (1) inlet air sample and one (1) outlet air sample. Samples will be collected in 10 L Tedlar bags with a Vac'Scent air sampling chamber, without exception, simultaneously. Each set of samples shall be collected in duplicate to minimize the risk of sample loss during shipping. Duplicate samples will only be analyzed in the event of sample loss. Bag samples will be shipped to St. Croix Sensory (Lake Elmo, MN) or equal laboratory via UPS Next Day Air for analysis within 30 hours in accordance with ASTM 679-91. The airflow presentation rate shall be 20 L/min.

I. Odor Acceptance criteria

1. The system's odor removal efficiency shall be determined by calculating the average inlet odor Detection Threshold and the average outlet odor Detection Threshold and using the following formula: odor removal efficiency (%) = (1 – (average outlet odor Detection Threshold / average inlet odor Detection Threshold)) x 100.
2. The system shall have passed the odor performance test if the average (if more than one sample per system) inlet and outlet odor Detection Thresholds indicate 95 % removal of odors for inlet air odor Detection Thresholds ≥ 4,000 but ≤ 60,000 OU. If the inlet air has an average odor Detection Threshold of < 4,000 OU then the outlet air will have an average Detection Threshold of ≤ 200 OU.
3. In the event that the maximum odor Detection Threshold during the four (4) hour test period exceeds the maximum allowable odor Detection Threshold listed in the Specification, the odor acceptance criteria shall not apply and the system shall be considered to have passed the performance test.

J. Penalties

1. In the event equipment fails to meet the performance requirements ser forth in this specification after three (3) attempts, penalties will be assessed as follows.
   a. CONTRACTOR/SUPPLIER will replace the current system in its entirety with a unit which will meet the requirements set forth in this specification at no cost to the OWNER. The CONTRACTOR/SUPPLIER will be responsible for any improvements to the site that will be required for the installation of the new system.
2. If the new system is unable to meet the requirements set forth in this specification after three (3) attempts, the City will be refunded the total cost of the system and any and all appurtenances installed for system operation, including by not limited to piping, slab work, water services, etc.

3.06 MANUFACTURERS SERVICES

A. In addition to being available by phone to assist the CONTRACTOR during the off-loading, installation, and startup of the equipment, the following Manufacturer's

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services shall be provided with the number of trips and days on site as a minimum.

1. Startup assistance: One (1) Trip, Two (2) days on site
2. Performance testing assistance/training: One (1) Trip, One (1) day on site

B. Notwithstanding the above, the Manufacturer shall continue to assist the CONTRACTOR with questions, issues and remote assistance until the system is properly installed, running satisfactorily and handed over to the OWNER.

C. Within the first year of operation a direct employee of the manufacturer (not local representative) shall make two (2) semiannual visits for one year after installation to ensure proper operation of each system. Visits shall be scheduled with the OWNER to obtain data from varying seasons.

3.07 EQUIPMENT NAME PLATES

A. Each separate piece of equipment shall be furnished with a unique name plate identifying the Manufacturer, model & serial number, date of manufacture and, if applicable, capacity and any performance limitations. The nameplates shall be plastic and firmly affixed to the exterior surface of the equipment and in a location that is accessible and easily read.

END OF SECTION 11700

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SECTION 13125

METAL BUILDING SYSTEMS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Roof panels and wall panels.
   2. Incidental building components, accessories and trim, where applicable.

B. Related Sections include the following:
   1. Division 3 Section "Cast-in-Place Concrete" for concrete foundations and anchor-bolt installation.

1.03 DEFINITIONS

A. Bay Spacing: Dimension between main frames measured normal to frame (at centerline of frame) for interior bays, and dimension from centerline of first interior main frame measured perpendicular to end wall (outside face of end-wall girt).

B. Building Length: Dimension of the building measured perpendicular to main framing from end wall to end wall (outside face of girt to outside face of girt).

C. Building Width: Dimension of the building measured parallel to main framing from sidewall to sidewall (outside face of girt to outside face of girt).

D. Clear Span: Distance between supports of beams, girders, or trusses (measured from lowest level of connecting area of a column and a rafter frame, or knee).

E. Eave Height: Vertical dimension from finished floor to eave (the line along the sidewall formed by intersection of the planes of the roof and wall).

F. Clear Height Under Structure: Vertical dimension from finished floor to lowest point of any part of primary or secondary structure, and all ventilation, fire protection, electrical and any other component suspended in the roof including clearances at the frames and between the frames.

G. Terminology Standard: Refer to MBMA's "Low Rise Building Systems Manual" for definitions of terms for metal building system construction not otherwise defined in this Section or in referenced standards.

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1.04 SYSTEM PERFORMANCE REQUIREMENTS

A. General
1. Provide a complete, integrated set of metal building system manufacturer's standard mutually dependent components and assemblies that form a metal building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior. Include primary and secondary framing, roof panels, and accessories complying with requirements indicated, including those in this Article.
2. The metal building system shall be designed to resist all applicable loads and shall be the lateral wind resisting system of the building. The metal building standing seam panel shall be the manufacturers standard standing seam panel.

B. Metal Building System Design: Of size, spacing, slope, and spans indicated, and as follows:
1. Primary Frame Type: Provide the following:
   a. A solid web modular rigid frame with no interior columns
2. End-Wall Framing: Engineer end walls to be non-expandable. Provide primary frame, capable of supporting applicable design loads, and end-wall columns. Provide load-bearing end-wall and corner columns and rafters.
3. Secondary Framing System: Varco Pruden Buildings framing system as specified in this specification section.
   a. C/Z Purlins and Girts: Acrylic-coated G30 galvanized finish.
4. Eave Height: As required to achieve minimum vertical clearances as outlined herein and shown on the Drawings.
5. Bay Spacing: As indicated on the Drawings.
6. Roof Slope: As indicated on the Drawings.
7. Roof System: Manufacturer’s standard standing-seam roof.

C. Structural Performance: Provide the metal building system capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated in strict accordance with the latest edition of the Florida Building Code.
1. Engineer metal building systems according to procedures in MBMA's "Low Rise Building Systems Manual”.
2. Design Loads: Comply with load requirements of MBMA's "Low Rise Building Systems Manual", the latest edition of the Florida Building code and as specified herein.
3. Roof Live Loads: The building roof live load shall be 20 PSF applied in accordance with referenced codes include vertical loads induced by the building occupancy indicated. Include loads induced by maintenance workers, materials, and equipment for roof live loads.

4. Roof Snow Loads: Include vertical loads induced by the weight of snow, as determined by 50-year mean-recurrence-interval ground snow load at Project site. Allow for unbalanced and drift loads.
5. Wind Loads: Include loads induced by the basic wind speed of 150 mph and as outlined on the Drawings in accordance with the Florida Building Code.
6. Collateral Loads: Include additional dead loads other than the weight of metal building system for permanent items such as mechanical systems, electrical systems, and ceilings as indicated on drawings.
7. Load Combinations: Design metal building systems to withstand the most critical effects of load factors and load combinations.
8. Deflection Limits: Engineer assemblies to withstand design loads with deflections no greater than that allowed by Code based on the function, serviceability and material types being used.
9. Design secondary framing system to accommodate deflection of primary building structure and construction tolerances, and to maintain clearances at openings.

D. Seismic Performance: Design and engineer metal building system capable of withstanding the effects of earthquake motions determined according to the building code in effect for this Project of ASCE 7, “Minimum Design Loads for Buildings and Other Structures”: Section: Section 9, “Earthquake Loads”, whichever is more stringent.

E. Thermal Movements: Provide metal building roof and wall panel systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
      Note: An expansion joint has not been included in either direction for the building. If an expansion joint is required due to excessive length and/or width of building, the metal building manufacturer, through the bidding general contractor, must provide notification two weeks prior to the bid receipt date such that a modification to the plans can be incorporated if deemed necessary.

1.05 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of the following metal building system components:
   1. Structural-framing system.
   2. Roof panels
   3. Wall panels
   4. Accessories and Incidentals

B. Shop Drawings: For the following metal building system components. Include plans, elevations, sections, details, and attachments to other Work.
   1. For installed components indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   2. Anchor-Bolt Plans: Include location, diameter, and projection of anchor bolts required to attach metal building to foundation. Indicate column reactions at each location. The metal building manufacturer must provide a summary sheet of the maximum imposed loads at each column location based on the Code required load combinations so that the foundation design can be checked by the Engineer.
   3. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.
   4. Roof Panel Layout Drawings: Show layouts of panels on support framing, details of edge conditions, joints, panel profiles, corners, custom profiles, supports, anchorages, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work. Roof panels shall be not spliced more than twice from eave to ridge.
   5. Accessory Drawings: Include details of the following items, at a scale suitable to show all details:
      a. Ventilators (if applicable)
      b. Louvers (if applicable)
      c. Gutters
      d. Downspouts

   Note: erection drawings showing the specific details of required flashing shall be included in the shop drawings for review and approval

C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of the following products with factory-applied color finishes:
   1. Roof and Wall Panels
   2. Trim and Closures
   3. Accessories

D. Samples for Verification: For the following products, in manufacturer's standard sizes, showing the full range of color, texture, and pattern variations expected, in the profile and style indicated. Prepare Samples from the same material to be used for the Work.
   1. Roof Panels: 12 inches (300 mm) long by actual panel width. Include clips, caps, battens, fasteners, closures, and other exposed panel accessories.
   2. Trim and Closures: 12 inches (300 mm) long. Include fasteners and other exposed accessories.
   3. Accessories: 12-inch- (300-mm-) long samples for each type of accessory.

E. Product Certificates: Signed by manufacturers of metal building systems certifying that products furnished comply with requirements.
   1. Letter of Design Certification: Signed and sealed by a qualified professional engineer for the state of Florida. Include the following:
      a. Name and location of Project.
      b. Order number.
      c. Name of manufacturer.
      d. Name of Contractor.
      e. Building dimensions, including width, length, height, and roof slope.
      f. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
      g. Governing building code and year of edition.
      h. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, and seismic zone or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads.
      i. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
      j. Building-Use Category: Indicate category of building use and its effect on load importance factors.
      k. AISC Certification for Category MB: Include statement that metal building system and components were designed and produced in an AISC-Certified Facility by an AISC-Certified Manufacturer.

F. Welding Certificates: Copies of certificates for welding procedures and personnel.

G. Erector Certificates: Signed by manufacturer certifying that erectors comply with requirements and are certified by the metal building manufacturer to install all of their systems that will be supplied on the project.

H. Manufacturer Certificates: Signed by manufacturers certifying that they comply with requirements. Include evidence of manufacturing experience.

I. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects

with project names and addresses, names and addresses of architects and owners, and other information specified.

J. Material Test Reports: From a qualified testing agency indicating and interpreting test results of steel for compliance with requirements indicated.

K. Warranties: Special warranties specified in this Section.

L. Minimum Qualifications: General Contractor, Metal Building Manufacturer and Certified Erector shall provide the required minimum qualification documentation outlined in the “Supplementary Conditions” section of this specifications in order to be accepted for this work.

1.06 QUALITY ASSURANCE

A. Erector Qualifications: An experienced erector who has specialized in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer; this requires an erector certification from the manufacturer or the ability to obtain in a timely manner that does not affect the construction schedule.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of metal building systems that are similar to those indicated for this Project in material, design, and extent.

C. Manufacturer Qualifications: A firm experienced in manufacturing metal building systems similar to those indicated for this Project and with a record of successful in-service performance.
   1. Manufacturer regularly engaged, for past 20 years, in manufacture of metal building systems of similar type to that specified.
   2. Primary manufacturer of frames, secondary steel, roof and wall sheeting, and trim.
   3. AISC Certification for Category MB: An AISC-Certified Manufacturer that designs and produces metal building systems and components in an AISC-Certified Facility and/or accredited based on IAS Accreditation Criteria AC472 and requirements in International Building Code (IBC), Chapter 17
   4. Engineering Responsibility: Preparation of Shop Drawings, testing program development, test result interpretation, and comprehensive engineering analysis by a qualified professional engineer.

D. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

E. Source Limitations: Obtain each type of metal building system component through one source from a single manufacturer.

F. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, or in-service performance.

G. Product Options: Drawings indicate size, profiles, and dimensional requirements of metal building system and are based on the specific system indicated. Other manufacturers' systems with equal performance characteristics may be considered.
   1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

H. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel"; and AWS D1.3, "Structural Welding Code--Sheet Steel”.

I. Regulatory Requirements: Fabricate and label structural framing to comply with special inspection requirements at point of fabrication for welding and other connections required by authorities having jurisdiction.

J. Structural Steel: Comply with AISC S335, "Specification for Structural Steel Buildings--Allowable Stress Design, Plastic Design"; or AISC S342, "Load and Resistance Factor Design Specification for Structural Steel Buildings," for design requirements and allowable stresses.

K. Cold-Formed Steel: Comply with AISI SG-671, "Specification for the Design of Cold-Formed Steel Structural Members," and AISI SG-911, "Load and Resistance Facet Design Specification for Steel Structural Members," for design requirements and allowable stresses.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, panels, and other manufactured items so as not to be damaged or deformed. Package roof panels for protection during transportation and handling.

B. Handling: Unload, store, and erect roof and wall panels to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight and ventilated covering. Store roof wall panels to ensure dryness. Do

not store panels in contact with other materials that might cause staining, denting, or other surface damage.

1.08 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when weather conditions permit roof panel installation to be performed according to manufacturer's written instructions and warranty requirements.

B. Field Measurements: Verify metal building system foundations by field measurements before metal building fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Established Dimensions for Foundations: Where field measurements cannot be made without delaying the Work, establish foundation dimensions and proceed with fabricating structural framing without field measurements. Coordinate anchor-bolt installation to ensure that actual anchorage dimensions correspond to established dimensions.
   2. Established Dimensions for Panels: Where field measurements cannot be made without delaying the Work, either establish framing and opening dimensions and proceed with fabricating roof panels without field measurements or allow for field-trimming panels. Coordinate roof and wall construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.

1.09 COORDINATION

A. Coordinate size and location of concrete foundations and casting of anchor-bolt inserts into foundation walls and footings. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete".

1.10 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Manufacturer shall warranty installed system for the periods described herein, starting from Date of Substantial Completion, against all the conditions indicated below. When notified in writing from Owner, manufacturer/installer shall, promptly and without inconvenience and cost to Owner, correct said deficiencies.
   1. Materials and Workmanship Warranty:
   2. Warranty Period: 5 years, premium

C. Standing Seam Roof Premium Weathertight Endorsement:
   1. Finish coating shall not peel, blister, chip, crack or check in finish, and shall not chalk in excess of 8 numerical ratings when measured in accordance with ASTM D 4214.
   2. Finish coating shall not change color or fade in excess of 5 NBS units as determined by ASTM D 2244.

D. Finish Warranty:
   1. Finish coating shall not peel, blister, chip, crack or check in finish, and shall not chalk in excess of 8 numerical ratings when measured in accordance with ASTM D 4214.
   2. Finish coating shall not change color or fade in excess of 5 NBS units as determined by ASTM D 2244.
      a. Panel finish: 25 years.

E. Performance Warranty: Furnish written warranty, stating sheet metal roofing system and flashing (flashing under premium warranty only) under this Section will be maintained in watertight condition and defects resulting from the following items will be corrected without cost to Owner for a period of 20 years.
   1. Faulty workmanship
   2. Defective materials including sealants and fasteners
   3. Water infiltration

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or equivalent:
   1. Varco-Pruden Buildings; a division of BlueScope Buildings, NA
   2. Nucor Building Systems
   3. Butler Manufacturing Company
   4. American Building
   5. ACI Building System
   6. Kirby Building Systems
   7. Ludwig Building Enterprises
   8. Metallic Building Company
   9. Vulcan Steel Structures, Inc.

2.02 STRUCTURAL-FRAMING MATERIAL

A. Structural-Steel Shapes: ASTM A 36/A 36M or ASTM A 529/A 529M.

B. Steel Plate, Bar, or Strip: ASTM A 529/A 529M, ASTM A 570/A 570M, or ASTM A 572/A 572M; 50,000-psi (345-MPa) minimum yield strength.

C. Steel Tubing or Pipe: ASTM A 500, Grade C; ASTM A 501; or ASTM A 53, Grade B.

D. Structural-Steel Sheet: Hot-rolled, ASTM A 570/A 570M, Grade 50 or Grade 55; hot-rolled, ASTM 568/A 568M; or cold-rolled, ASTM A 611, structural-quality, matte (dull) finish.

E. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, structural quality, Grade 50, with G60 (Z180) coating designation; mill phosphatized.

F. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M and the following requirements:
   1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality.

G. Steel Joists: Provide joists, complying with SJI's "Standard Specifications, Load Tables, and Weight Tables for Steel Joists and Joist Girders," manufactured with steel-angle top and bottom chord members, to produce joist types, end arrangements, and top chord arrangements indicated and required for secondary framing.

H. Non-High-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); carbon-steel, hex-head bolts; carbon-steel nuts; and flat, unhardened steel washers.

I. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers.

J. Anchor Rods, Bolts, Nuts, and Washers: As follows:
   1. Unheaded Rods: ASTM A 36/A 36M.
   2. Unheaded Rods: ASTM A 572/A 572M, Grade 50 (Grade 345).
   3. Unheaded Bolts: ASTM A 687, high strength.
   4. Headed Bolts: ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); carbon-steel, hex-head bolts; and carbon-steel nuts.
   5. Headed Bolts: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts and heavy hex carbon-steel nuts.
   6. Washers: ASTM A 36/A 36M.

K. Painting of Structural Steel Framing System
   1. General:
      a. Structural Steel: Prime paint as temporary protection against ordinary atmospheric conditions.
      b. Perform subsequent finish painting, if required, in field as specified in the painting section.
      c. Before painting, clean steel of loose rust, loose mill scale, dirt, and other foreign materials.

2. Steel Fabricator: Not required to sand blast, flame clean, or pickle steel before painting, unless otherwise specified.
3. Primary Frames:
   a. Clean steel in accordance with SSPC-SP2.
   b. Factory cover steel with 1 coat of gray water-reducible alkyd primer paint formulated to equal or exceed performance requirements SSPC-Paint 15.
   c. Minimum Coating Thickness: 1.0 mil.
4. Secondary Structural Members – Roll-Formed:
   a. Hot-dipped zinc coating, ASTM A 653, G30; followed by 1 coat of clear acrylic finish.
   b. Acrylic-Coated G30 Galvanized Steel: Equal or exceed performance requirements of SSPC Paint-15.
5. Truss Purlins:
   a. Hot-dipped zinc coating, ASTM A 653, G30; followed by 1 coat of clear acrylic finish.

b. Acrylic-Coated G30 Galvanized Steel: Equal or exceed performance requirements of SSPC Paint-15.

2.03 PANEL MATERIALS

A. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M and the following requirements:
   1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality.

B. Panel Sealants: Provide the following:
   1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
   2. Joint Sealant: ASTM C 920; one-part elastomeric polyurethane, polysulfide, or silicone-rubber sealant; of type, grade, class, and use classifications required to seal joints in panels and remain weathertight; or as recommended by metal building system manufacturer.

2.04 INSULATION MATERIALS:

A. Schedule:
   1. Roof insulation: Nominal values:
      a. Blanket insulation - 6 inches (150 mm); R-value: 19. / U-Factor = 0.065
   2. Wall Insulation: Nominal values:
      a. Blanket insulation - 4 inches (100 mm); R-value: 15. / U-Factor = 0.162

B. Blanket Insulation: Glass fiber, with factory laminated facing material
   1. Glass fiber: Odorless, neutral colored, long filament, flexible resilient, produced in compliance with NAIMA 202-96.

2. Flame spread Index: The composite of fiberglass and facing shall have surface burning characteristics not to exceed 25 flame spread when tested in accordance with UL 723 or ASTM E 84 test methods.
3. Smoke Developed Index: not to exceed 50 smoke development when tested in accordance with UL 723 or ASTM E 84 test methods.
4. UL Classified.
5. Provide facing 3 inches (75 mm) wider than blanket on both edges.

Width: As required for installation.

C. Thermal Blocks: High density, 3/4 inch (19 mm) thick expanded polystyrene, for installation over the purlin.

2.05 FABRICATION

A. General: Design components and field connections required for erection to permit easy assembly and disassembly.
1. Fabricate components in a manner that once assembled in the shop, they may be disassembled, repackaged, and reassembled in the field.
2. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.
3. Fabricate framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Cold-formed members shall be free of cracks, tears, and ruptures.

B. Primary Framing: Shop-fabricate framing components to indicated size and section with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.
1. Make shop connections by welding or by using high-strength bolts.
2. Join flanges to webs of built-up members by a continuous submerged arc-welding process.
3. Brace compression flange of primary framing by angles connected between frame web and purlin or girt web, so flange compressive strength is within allowable limits for any combination of loadings.
4. Weld clips to frames for attaching secondary framing members.
5. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime primary structural members with specified primer after fabrication.

C. Secondary Framing: Shop-fabricate framing components to indicated size and section by roll-forming or break-forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.
1. Make shop connections by welding or by using non-high-strength bolts.
2. Roll-formed Secondary Finish: Hot-dipped zinc coating, ASTM A 653, G30; followed by 1 coat of clear acrylic finish.
3. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime secondary structural members with specified primer after fabrication.

D. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply the specified air-dried primer immediately after cleaning and pretreating.
   1. Prime primary, secondary, and end-wall steel framing members with specified primer to a minimum dry film thickness of 1 mil (0.025 mm).
      a. Prime secondary steel framing formed from metallic-coated steel sheet with red-oxide polyester paint, with a minimum dry film thickness of 0.5 mil (0.013 mm) on each side.
   2. Prime galvanized members, after phosphoric acid pretreatment, with manufacturer's standard zinc dust, zinc-oxide primer.

E. Tolerances: Comply with MBMA's "Low Rise Building Systems Manual": Chapter IV, Section 9, "Fabrication and Erection Tolerances”.

2.06 STRUCTURAL FRAMING

A. Primary Framing: Manufacturer's standard structural primary framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafter, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing.
   1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.
      a. Slight variations in span and spacing may be acceptable if necessary to meet manufacturer's standard, as approved by Architect.
   2. Rigid Clear-Span Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes.
   3. Rigid Modular Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Provide interior columns fabricated from round steel pipe or tube, or shop-welded, built-up steel plates.
   4. Frame Configuration: As indicted on Drawings.
   5. Exterior Column Type: Uniform depth with depth restrictions.
   6. Rafter Type: Tapered with clear dimension requirements.

B. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly to comply with the following:
   1. End-Wall and Corner Columns: I-shaped sections fabricated from structural-steel shapes; shop-welded, built-up steel plates; or C-shaped, cold-formed, structural-steel sheet; with minimum thickness of 0.0747 inch (1.9 mm).
   2. End-Wall Rafters: I- or C-shaped, hot-rolled or cold-formed, structural-steel sheet; with minimum thickness of 0.0598 inch (1.5 mm).

C. Secondary Framing: Manufacturer's standard secondary framing members, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members as applicable. Fabricate framing from cold-formed, structural-steel sheet or roll-formed, metallic-

coated steel sheet prepainted with coil coating, unless otherwise indicated, to comply with the following:

1. Purlins:
   a. Open-Web Truss Purlins:
      1) Cold-formed trusses, factory assembled.
      2) By design.
   b. Attach purlins to main frames and endwalls with minimum 1/2-inch-diameter bolts.
   c. Brace purlins at intervals indicated on erection drawings furnished by metal building system manufacture or roof joist supplier through the metal building manufacturer.
   d. Concentrated Loads: Hung at purlin panel points.
2. Eave Members:
   a. Eave Struts: 7-inch, 8-1/2-inch, 10-inch, or 11-1/2-inch-deep "C" sections, precision-roll-formed, acrylic-coated G30 galvanized steel in different gauges to meet specified loading conditions.
3. Girts:
   a. "Z" or “C”-shaped, precision-roll-formed, acrylic-coated G30 galvanized steel in different gauges to meet specified loading conditions.
   b. 7-inch, 8-1/2-inch, 10-inch, or 11-1/2-inch-deep "Z" or “C” sections.
4. Flange Braces and Purlin Braces: Cold formed and installed as indicated on the Drawings.
5. Base or Sill Angles: Minimum 3-by-2-by-0.0747-inch (76-by-51-by-1.9-mm) zinc-coated (galvanized) steel sheet.
6. Purlin and Girt Clips: Minimum 0.1345-inch- (3.4-mm-) thick, zinc-coated (galvanized G-30) steel sheet. Note: The metal building manufacturer shall supply their highest strength hurricane wind clips in the increased wind pressure zones of the roof and walls at the corners, end, and side zones shown on the drawings.
7. Secondary End-Wall Framing: Manufacturer's standard sections fabricated from minimum 0.0747-inch- (1.9-mm-) thick, zinc-coated (galvanized) steel sheet.
8. Framing for Openings: Channel shapes; fabricated from minimum 0.0598-inch- (1.5-mm-) thick, cold-formed, structural-steel sheet or structural-steel shapes. Frame head and jamb of door openings, and head, jamb, and sill of other openings.
9. Miscellaneous Structural Members: Manufacturer's standard sections fabricated from cold-formed, structural-steel sheet; built-up steel plates; or zinc-coated (galvanized) steel sheet; designed to withstand required loads.

D. Bracing: Provide adjustable wind bracing as follows: Note: The bracing detail shall be such that it can be adjusted with all roof joists in place and shall not touch the welding and roof joints.
   1. Rods: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade D; or ASTM A 529/A 529M, Grade 50; 1/2-inch- (13-mm-) diameter steel; threaded full length or threaded a minimum of 12 inches (300 mm) at each end.

2. Cable: ASTM A 475, 1/4-inch- (6-mm-) diameter, extra-high-strength grade, Class B zinc-coated, seven-strand steel; with threaded end anchors.
   Note: Cable is not allowed in the walls.
3. Rigid Portal Frames: Fabricate from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.
4. Diaphragm Action of Panels: Design metal building to resist wind forces through diaphragm action of roof and wall panels.
5. Bracing: Provide wind bracing using the methods specified above, at manufacturer's option, with limitations shown on Drawings (i.e. no disruption of aesthetic and structural features of building.

E. Bolts: Provide shop-painted bolts unless structural-framing components are in direct contact with roof and wall panels. Provide zinc-plated bolts when structural-framing components are in direct contact with roof panels.

2.07 ROOF PANELS

A. SSR Standing Seam Roof Panels; 24 inches (610 mm) wide net coverage, with 3 inches (75 mm) high major ribs formed at the panel side laps, formed for field seaming using electrically operated seaming machine.
   1. Side joints: Factory applied sealant for field seaming.
   2. Material: Galvalume steel.
   3. Finish: Kynar 500 or approved equal
   4. Minimum Thickness: 22 gage (0.58 mm).
   5. Standard Roof pitch 2 inches (51 mm):12
   6. Side laps: Two factory-formed interlocking ribs, with one weather sealed joint, field-seamed into place to form a double-fold 360-degree seam.
   7. Length: Continuous from eave to ridge with only no seams, except at panel interruptions such as roof fans.
   8. End laps, where required: 4 inches (102 mm) wide, located at a support member.
   9. Staggered Panel endlaps, where required, to avoid a four-panel lap splice.
   10. Panel-to-roof purlin structural attachments: SSR clips with movable tabs which interlock with seamed SSR panel ribs and provide for 1-5/8 inches (41 mm) of panel movement in either direction from center of clip to compensate for thermal effects. Note: The metal building manufacturer shall their highest strength/capacity hurricane roof clips (regardless of design not requiring) in the high wind side, corner, and zones of increased wind pressures as shown on the drawings
   11. Ridge assembly for high end of slopes: SSR Ridge; draw-formed aluminum seam caps factory-attached to SSR ridge panels that are seamed together along the center of the ridge, utilizing only one weather sealed joint and providing a true expansion joint for panel movement.
   12. Rake edge of roof shall be attached to the building structure in a manner which will allow thermal expansion of the SSR roof panels along the gables and will provide the uplift resistance required by code.

13. SSR roof will meet the requirements for UL Class 90 wind uplift. Certification includes IAS.
14. Exposed fasteners are stainless steel capped painted to match the selected color from the VP color chart or special ordered if a special color roof is provided

2.08 WALL PANELS

A. Wall Panels: Panel Rib; 36 inch (915 mm) wide net coverage, with 1-3/16 inch (30 mm) high major ribs at 12 inches (305 mm) on center with minor ribs spaced between the major ribs.
B. Material: Galvanized steel, with G90/Z275 coating.
C. Minimum Thickness: 24 gage minimum (0.46 mm).
D. Side laps: Two fully overlapping major ribs secured together with 1/4 inch (6 mm) diameter color-matched carbon steel fasteners.
E. Length: Continuous from sill to eave, except at wall openings.
F. End laps, where required: 4 inches (100 mm) wide, located at a support member.
G. Crimp panels at the base to achieve no gaps against the foundation greater than 1/16 inch and notch to match roof panel configuration at the eave.
H. The KXL paint system is a PVDF finish applied to the zinc or zinc aluminum coated steel to give a long life color that resists fading and chalking. KXL is a 1 mil nom. PVDF finish with 70 percent Kynar 500 or Hylar 5000standard.
I. Certification includes IAS Miami-Dade County Florida product approval

2.09 DOORS AND FRAMES – Specified Elsewhere

2.10 WINDOWS – Specified Elsewhere

2.11 ACCESSORIES

A. General: Provide accessories as standard with metal building system manufacturer, and complying with the following:
   1. Provide sheet metal accessories of same material and in same finish as roof and wall panels, unless otherwise indicated.

B. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide fasteners with heads matching color of roof or wall sheets by means of plastic caps or factory-applied coating. Comply with the following:
   1. Fasteners for Roof and Wall Panels: Self-drilling or self-tapping 410 stainless or zinc-alloy steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of panels. Note: must be coordinated with overall roof panel systems attachment.
   2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
   3. Blind Fasteners: High-strength aluminum or stainless-steel rivets.

C. Flashing and Trim: Form from 0.0179-inch- (0.45-mm-) thick, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet pre-painted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent roof or wall panels.

D. Eave Gutters: Roll-formed 26 gage (0.45 mm) steel sheet, with gutter straps, fasteners and joint sealant; manufacturer's standard color.

E. Downspouts: 26 gage 4 inches by 5 inches (100 by 125 mm) or larger as required for runoff volumes and in 10 foot (3050 mm) lengths, with downspout elbows and downspout straps; same color as wall panels unless specified otherwise.

F. Closures: Closed-cell, laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

2.12 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Contractor shall examine substrates, with Erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of metal building system.
   1. For the record, prepare written report, endorsed by Erector, listing conditions detrimental to performance of work.
   2. Proceed with erection only after unsatisfactory conditions have been corrected.

B. Before erection proceeds, survey elevations and locations of concrete bearing surfaces, baseplates, and anchor bolts to receive structural framing. Verify compliance with requirements and metal building system manufacturer's tolerances.
   1. Engage land surveyor to perform surveying.

3.02 PREPARATION

A. Clean substrates of substances, including oil, grease, rolling compounds, incompatible primers, and loose mill scale, that impair bond of erection materials.

B. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

3.03 ERECTION

A. Erect metal building system according to manufacturer's written instructions and erection drawings.

B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.

C. Set structural framing in locations and to elevations indicated and according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.

D. Baseplates and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen surfaces before setting baseplates and bearing plates. Clean bottom surface of baseplates and bearing plates.
   1. Set baseplates and bearing plates for structural members on wedges, shims, or setting nuts.
   2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of baseplate or bearing plate before packing with grout.
   3. Pack grout solidly between bearing surfaces and plates so no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure
      a. Comply with manufacturer's written instructions for proprietary grout materials.

E. Align and adjust framing members before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Make adjustments to compensate for discrepancies in elevations and alignment.
   1. Level and plumb individual members of structure.
   2. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.

F. Primary Framing and End Walls: Erect framing true to line, level, plumb, rigid, and secure. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist cure grout for not less than seven days after placement.

1. Make field connections using high-strength bolts. Tighten bolts by turn-of-the-nut method.

G. Secondary Framing: Erect framing true to line, level, plumb, rigid, and secure. Fasten secondary framing to primary framing using clips with field connections using non-high-strength bolts. Hold rigidly to a straight line by sag rods.
   1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
   2. Locate and space wall girts to suit door and window arrangements and heights.
   3. Locate canopy framing as indicated.
   4. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.

H. Bracing: Install bracing in roof and portal frames in walls where indicated on erection drawings.
   1. Tighten rod and cable bracing to avoid sag.

3.04 ROOF AND WALL PANEL INSTALLATION

A. General: Provide roof panels with minimum splices and staggered endlaps from eave to ridge. Install panels perpendicular to purlins.
   1. Install in compliance with manufacturer's instructions.
   2. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.
   3. Fasten cladding system to structural supports, aligned level and plumb.
   4. Locate end laps over supports. End lap panels according to manufacturer's recommendations. Place sidelaps over adjacent panel and mechanically seam or stitch fastener per erection guidelines.
   5. Provide expansion joints where required; this determination shall be by the metal building manufacturer.
   6. Use concealed fasteners where required.
   7. Install sealant and gaskets to prevent weather penetration.
   8. Install system free of rattles, noise due to thermal movement, and wind whistles.
   9. Install door frames, service doors, overhead doors, window and glass, and gutter system in compliance with manufacturer's instructions.
   10. Seal wall and roof accessories watertight and weathertight with sealant in compliance with building manufacturer's standard procedures.
   11. Rigidly support and secure gutters and downspouts. Joint lengths with formed seams sealed watertight. Flash and seal gutters to downspouts.
   12. Tolerances:
   13. Framing Members: 1/4 inch (6 mm) from level; 1/8 inch (3 mm) from plumb.
   14. Racking: 1/8 inch (3 mm) from true position. Provide shoring to maintain position prior to cladding installation

3.05 ACCESSORY INSTALLATION

A. General: Install gutters, downspouts, ventilators, louvers, and other applicable accessories according to manufacturer's written instructions, with positive

anchorage to building and weathertight mounting. Coordinate installation with flashings and other components.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
   1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
   2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).
   3. Separations: Separate metal from incompatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.

C. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 4 feet (1.2 m) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

D. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1500 mm) o.c. in between.
   1. Tie downspouts to underground drainage system as shown.

3.06 ERECTION AND LOCATION TOLERANCES

A. Structural-Steel Erection Tolerances: Comply with erection tolerance limits of AISC S303, "Code of Standard Practice for Steel Buildings and Bridges”.

B. Roof Panel Installation Tolerances: Shim and align units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.07 FIELD QUALITY CONTROL

A. Testing Agency: Owner may engage a qualified independent testing agency to perform field quality-control testing.

B. Extent and Testing Methodology: Testing and verification procedures will be required of high-strength bolted connections.
   1. Bolted connections will be visually inspected.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

3.08 CLEANING AND PROTECTION

A. Touchup Painting: Immediately after erection, clean, prepare, and prime or reprime welds, bolted connections, and abraded surfaces of prime-painted primary and secondary framing, accessories, and bearing plates.
   1. Clean and prepare surfaces by hand-tool cleaning, SSPC-SP 2, or power-tool cleaning, SSPC-SP 3.
   2. Apply compatible primer of same type as shop primer used on adjacent surfaces.

B. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

C. Roof Panels: Remove temporary protective coverings and strippable films, if any, as soon as each panel is installed. On completion of panel installation, clean finished surfaces as recommended by panel manufacturer and maintain in a clean condition during construction.
   1. Replace panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 13125

SPECIFICATION 15050

VIBRATION AND WIND CONTROLS

PART 1 GENERAL

1.0 DESCRIPTION

. Scope:

0. Contractor shall provide all professional services, labor, materials, tools, equipment, and incidentals as shown, specified, and required to design, furnish, and install vibration control and wind control for process mechanical, HVAC, plumbing, fire protection, electrical, instrumentation and control, and architectural components.

1. Extent of components requiring controls are described in this section and as required by laws and regulations. The work includes:

. Vibration Controls for Components.

a. Wind Controls for Components.

2. The Work excludes:

. No exclusions.

A. Coordination:

0. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before, the vibration and wind controls Work.

B. Related Sections:

1.1 SECTION 15830, FANSREFERENCES

. Standards referenced in this Section are:

0. AWS D1.1, Structural Welding Code – Steel.

1. AWS D1.2, Structural Welding Code – Aluminum.

2. AWS D1.3, Structural Welding Code – Sheet Steel.

3. AWS D1.6, Structural Welding Code – Stainless Steel.

4. CISCA 0-2, Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings.

5. CISCA 3-4, Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings.

6. National Roofing Contractors Association (NRCA) Standards.

1.2 DEFINITIONS

. The following definitions are used in this Section:

0. Components: Process Mechanical, HVAC, plumbing, fire protection, electrical, instrumentation and control, architectural, and other non-structural equipment, systems, and elements permanently attached to structures, including supporting structures and attachments.

1. Component Assembly: Component assembled by Contractor from individual components of different Suppliers.

2. Controls: Vibration Control and Wind Control.

3. Controls Design Engineer: Professional Engineer responsible for Vibration Control and Wind Control.

4. Essential Facility: Buildings and other structures intended to remain operational in event of extreme environmental loading from flood, wind, snow, or earthquakes.

5. Failure: Separation of an attachment between Components, or Components and structure, vertical permanent deformation greater than 1/8-inch, horizontal permanent deformation greater than 1/4-inch, or failure of the equipment to perform its function.

6. Hazardous Contents: Material that is highly toxic or potentially explosive in sufficient quantity to pose significant life-safety threat to personnel working in building or the general public if an uncontrolled release were to occur.

7. Isolated Component: Component indirectly connected to structure through Control designed to prevent transmission of Component vibration to structure.

8. Lateral Forces: Horizontally applied forces resulting from wind.

9. Life Safety Systems: All systems involved with fire protection including sprinkler piping, water service piping, jockey pumps, fire pumps, fire dampers, smoke dampers, smoke exhaust systems, control panels and fire alarm panels associated with fire protection

Components, and Components in Essential Facilities necessary for keeping the Essential Facility Operational.

10. Non-Isolated Component: Component that is connected to structure in such a way that allows transmission of Component vibration to structure.

11. Operational: Capable of providing intended function.

12. Process Mechanical: All mechanical Components that are not part of HVAC, plumbing and fire protection Components.

13. Vibration Control: Vibration isolating systems.

14. Wind Control: Wind restraining systems.

1.3 QUALITY ASSURANCE

. Qualifications:

0. Supplier:

. Minimum of five years of experience producing Controls substantially similar to those specified in the Contract Documents and able to provide evidence of at least five installations in satisfactory operation for at least five years in the United States.

a. Design and analysis delegated through Supplier shall be performed by a registered Professional Engineer licensed in same state as the Site.

1. Controls Design Engineer:

. Engage registered Professional Engineer licensed in same state as the Site, who has a minimum of five years of experience in providing engineering services for Vibration and Wind Controls.

a. Submit qualifications data and include professional liability insurance certificate in amount of at least $1,000,000 per claim/aggregate with maximum deductible of $100,000.

b. Responsibilities include:

1) Reviewing performance and design criteria for Controls specified in the Contract Documents.

2) Determining sizes and locations of Controls.

3) Preparing or supervising preparation of design calculations and related drawings, Shop Drawings and submittals, testing plan development, test result interpretation, and comprehensive engineering analysis verifying compliance of Controls with the Contract Documents.

4) Signing and sealing all calculations, design drawings, and Shop Drawings.

5) Certifying that:

a) Design of Controls was performed in accordance with performance and design criteria stated in the Contract Documents.

b) Design conforms to Laws and Regulations, and to prevailing standards of practice.

6) Provide installation instructions and drawings.

7) Provide field quality control in accordance with Paragraph 3.3 of this Section.

2. Installer:

. Engage an experienced installer to perform the Work of this Section who specializes in installing Controls similar to that required for this Project.

a. Submit name and qualifications to Engineer with the following information on a minimum of three completed, successful projects:

1) Names and telephone numbers of Owners, and Architects or Engineers responsible for project.

2) Approximate cost of Control Work for which installer was responsible.

3. Welder:

. Qualify welding processes and welding operators in accordance with AWS D1.1, D1.2, D1.3, and D1.6 as appropriate for material to be welded.

a. Provide certification that welders employed on or to be employed for the Work have satisfactorily passed AWS qualification tests within previous 12 months. Ensure that all certifications are current.

A. Requirements for special inspections are in Division 1.

1.4 SUBMITTALS

. Informational Submittals: Submit the following:

0. Shop Drawings:

. Detailed schedules of flexible and rigidly mounted Components to receive Controls. Schedules shall be numbered and include Contract Drawing number references where Component is located.

a. Specific details of Controls and anchorages, including number, size, and locations for each Component.

b. Details of attachment methods where walls, floors, slabs, or supplementary steel work are used for restraint attachment.

c. Location of all attachment and support points and forces transferred to supporting structure at each location, as a result of each load combination of static forces and Lateral Forces.

d. Detailed piping, ductwork, and conduit restraining system layout drawings showing their attachment to building or structure. Include dimensions, size, and location of restraints and attachment connections. Coordinate with system layout shop drawings provided under other sections, as applicable.

1. Product Data:

. Supplier and model of Controls.

a. Supplier’s literature, performance data, weight, illustrations, specifications, identification of materials of construction, dimensions of individual parts, and finishes.

b. Setting drawings, templates, and directions for installation of anchor bolts and other anchorages.

2. Certifications:

. Provide completed Professional Design Services Performance Certification on Attachment A to this Section.

a. Controls Design Engineer’s professional liability insurance certificate per Paragraph 1.4.A.2.b of this Section.

3. Delegated Design Submittals:

. Information required to clearly demonstrate basis of design for Controls, including calculations, design dimensions, approach and assumptions, and Laws and Regulations on which design of Controls and anchorage is based. Design documents prepared by Controls Design Engineer shall bear the seal and original signature and date of the Controls Design Engineer. State of Engineer's registration, name, and license number shall be clearly legible on the seal.

4. Supplier's Instructions:

. Instructions for shipping, storage protection, handling, and installation.

a. Routine maintenance requirements prior to start up.

5. Field Quality Control Submittals:

. Supplier's Field Reports: Submit reports confirming that Controls have been installed in accordance with Supplier's recommendations and approved Shop Drawings and submittals.

a. Controls Design Engineer Report: Submit report confirming that Controls have been installed in accordance with the Controls design. Report shall bear the professional engineering seal, date, and original signature of the Controls Design Engineer.

6. Qualifications Statements: Submit qualifications for:

. Supplier.

a. Controls Design Engineer.

b. Installer.

c. Welder.

A. Closeout Submittals:

0. Operation and Maintenance Data:

. Submit complete operation, and maintenance manuals, including, test reports, maintenance data and schedules, description of operation, and spare parts information.

a. Conform to Division 1, Operation and Maintenance Data.

PART 2 PRODUCTS

2.0 SYSTEM PERFORMANCE

. System Description:

0. Schedules in Part 3 of this Section describe Components that are to receive Vibration Control.

1. Tables in Part 3 and performance criteria specified in Paragraph 2.1.C of this Section describes Controls to be provided on Components and systems described in the schedules. Tables are general in nature and may include certain Components that may not be specified in the schedules to receive Controls, while the schedules are Project-specific.

2. Where components are subject to wind, design component and related anchorage to supporting structure to resist wind loads per applicable building code using wind load factors indicated on structural drawings. Using guy wires is allowed for assisting in support of components.

3. Design of Components, including Vibration Controls provided by Component Supplier if required, and associated anchorage to supporting structure, are delegated through Supplier. Design shall resist wind forces according to requirements of Laws and Regulations using wind load factors indicated on structural Drawings.

4. Interconnection design of Component Assemblies, including Vibration Controls if required, and anchorage to supporting structure, shall be by Controls Design Engineer. Design of individual Components within assembly to resist wind forces is responsibility of individual Component Supplier. Component Assembly design shall resist wind forces according to requirements of Laws and Regulations using wind load factors indicated on structural Drawings. Coordinate design with each Supplier of Components used in the assembly and obtain approval of each Supplier prior to providing Shop Drawings for Component Assembly.

5. Equivalency: Products or methods specified for Controls are not intended to limit use of other products or methods of equivalent or superior quality and effectiveness.

A. Design Criteria:

0. Determine wind design loads as stipulated in the building code. Wind load design information is included on the structural Drawings.

1. Analyses for anchorage shall include calculated dead loads, Lateral Forces, and capacity of materials utilized for connections to Components and structure. Analysis for anchorage shall include anchoring methods, bolt diameter, embedment, and weld requirements.

2. Design Wind Controls to accept, without failure, wind forces acting on Component's exposed wind surface area. Analyses for wind forces shall consider Lateral Forces applied on a minimum of two orthogonal axes in two directions per axis. Overturning moments may result in uplift forces that exceed gravitational forces at ground level that shall be incorporated into analysis.

B. Performance Criteria:

0. Where location and characteristics of elements of supporting structure are not appropriate for supporting Component and transferring vertical and Lateral Forces, notify Engineer in writing.

1. Where changes in specified Components or location of Components are proposed by Contractor for convenience of Contractor and accepted by Engineer, modifications to supporting structure required by such changes shall be responsibility of Contractor at no additional cost to Owner. Design of modification shall consider all vertical and Lateral Forces and be signed, dated, and sealed by Controls Design Engineer.

2.1 MANUFACTURERS

. Provide products of one of the following:

0. Vibration Mountings and Controls, Inc.

1. Mason Industries.

2. Kinetics Noise Control.

3. Amber/Booth Company, Inc.

4. Or equal.

2.2 VIBRATION ISOLATION TYPES

. Type A: Spring Isolator - Free Standing

0. Not used.

A. Type B: Restrained Spring Isolator

0. Not used.

B. Type C: Combination Spring/Elastomer Hanger Isolator (30-degree Type)

0. Not used.

C. Type D: Elastomer Double Deflection Hanger Isolator

0. Molded neoprene element, minimum 1.25-inch thick, with Projecting bushing lining rod clearance hole. Static deflection at rated load shall be minimum of 0.35 inches.

1. Steel retainer box encasing neoprene mounting capable of supporting Component up to four times rated capacity of element.

2. Product and Manufacturer: Provide one of the following:

. RHD, manufactured by Vibration Mountings and Controls.

a. HD, manufactured by Mason Industries.

b. Or equal.

D. Type E: Combination Spring/Elastomer Hanger Isolator

0. Not used.

E. Type F: Restrained Elastomer Floor Isolator

0. Not used.

F. Type G: Pad Type Elastomer Isolator (Standard)

0. Not used.

G. Type H: Pad Type Elastomer Isolator (High Density)

0. Not used.

H. Type I: Thrust Restraints

0. Not used.

I. Type J: Pipe Anchors

0. Not used.

J. Type K: Pipe Guides

0. Not used.

K. Type L: Isolated Pipe Hanger System

0. Not used.

2.3 RESTRAINT TYPES

. Type I: Spring Isolator, Restrained

0. Not used.

A. Type II: Restrained Elastomer Floor Isolator

0. Not used.

B. Type III: All-Directional Snubber

0. Not used.

C. Type IV: Floor or Roof Anchorage

0. Rigid attachment to structure utilizing wedge-type anchor bolts, anchored plates machine screw, bolting or welding. Powder shots are unacceptable.

1. Product and Manufacturer: Provide one of the following:

. FA, manufactured by Vibration Mountings and Controls.

a. SAB, manufactured by Mason Industries.

b. Or equal.

D. Type V: Cable Restraints

0. Cable Restraints shall consist of steel aircraft cables sized to resist loads with minimum safety factor of 2.0, and arranged to provide all directional restraint. Cable end connections shall be steel assemblies that swivel to final installation angle and utilize two clamping bolts to provide proper cable engagement. Cables shall not bend across sharp edges. Single arm braces with resilient bushings can be substituted for cable restraints. Deck fitting shall have two through-bolts for attachment.

1. Product and Manufacturer: Provide one of the following:

. SCR, manufactured by Vibration Mountings and Controls.

a. SCB, manufactured by Mason Industries.

b. Or equal

E. Type VI: Rigid Arm Brace

0. Not used.

F. Type VII: Internal Clevis Cross Brace

0. Not used.

2.4 COMPONENT BASES

. General

0. All curbs and roof rails shall be anchored to building structural steel for resisting Lateral Forces. Fastening to metal deck is unacceptable.

A. Type B 1: Integral Structural Steel Base

0. Not used.

B. Type B 2: Concrete Inertia Base

0. Not used.

C. Type B 3: Isolation Curb

0. Not used.

D. Type B 4: Non-Isolated Curbs

0. Not used.

E. Type B 5: Isolated Component Supports

0. Not used.

F. Type B 6: Non-Isolated Component Supports

0. Not used.

G. Type B 7: Control/Electric Room Air Conditioning Unit Base

0. Not used.

2.5 FLEXIBLE CONNECTORS

. Type FC 2: Flexible Stainless Steel Hose

0. Not used.

2.6

2.6 MATERIALS OF CONSTRUCTION AND FINISHES

. Miscellaneous steel angles, supports, and appurtenances shall be cleaned and prime-coated in the shop and field-painted.

A. Hardware in corrosive areas shall be Type 316 stainless steel. Hardware in non-corrosive areas shall be galvanized steel.

B. Neoprene and elastomer parts shall be resistant to ultraviolet radiation and constructed from high grade materials suitable for exposure to high concentrations of hydrogen sulfides, mercaptans, chlorine, and moisture in air.

2.7 IDENTIFICATION

. Provide each Control device with Type 316 stainless steel tag embossed or engraved with serial number cross-referenced to Component schedule.

PART 3 EXECUTION

3.0 INSPECTION

. Examine areas and conditions under which Control Work is to be performed and notify Engineer in writing of conditions detrimental to proper and timely completion of Work. Do not proceed with Work until unsatisfactory conditions have been corrected in a manner acceptable to Engineer.

A. Coordinate anchorage of Components to receive Controls with installation locations. Examine roughing-in of reinforcing and cast-in-place anchor bolts to verify locations before installation.

3.1 COMPONENT INSTALLATION

. Install Controls in accordance with Supplier’s written instructions and Shop Drawings and submittals accepted by Engineer.

A. Rigid connections between Components and building structure shall not be made in a manner that degrades performance of Control systems.

B. Do not rigidly connect Isolated Components to building structure.

C. Bracing may occur from flanges of structural beams, upper truss chords in bar joist construction, and concrete inserts or cast-in-place anchor bolts. Component support shall not overstress the structure.

D. Install cable restraints with minimum slack to avoid short-circuiting associated Component.

E. Install cable assemblies without slack on Non-Isolated systems. Solid braces may be used in place of cables on rigidly attached systems except where single arm braces incorporate resilient bushings.

F. At locations where restraints or solid braces are located, brace support rods as required to accept compressive loads.

G. Minimum operating clearance under all Isolated Component bases shall be two inches.

3.2 FIELD QUALITY CONTROL

. Controls Design Engineer Services:

0. Controls design engineer shall check controls installation before controls and related equipment are placed into operation.

1. Controls design engineer shall make at least one visit to the site.

2. After controls installation is complete, controls design engineer shall inspect completed controls work and certify in writing to contractor that all systems are installed in accordance with design. Contractor shall submit control design engineer's report to engineer, certifying correctness of the work.

A. Supplier's Services:

0. Supplier shall check Controls installation before Controls and related equipment are placed into operation.

1. Supplier shall make at least one visit to the Site.

2. After installation of Controls is complete, Supplier shall inspect completed Controls Work and certify in writing to Contractor that Controls are installed in accordance with Supplier's recommendations and Shop Drawings and submittals accepted by Engineer. Contractor shall submit Supplier's report to Engineer certifying correctness of the Work.

3.3 ADJUSTING

. After entire system is started and under full operating load, adjust Controls so that Controls operate as designed.

3.4 CLEANING

. Remove debris from beneath Components and in and around the vibration isolator.

3.5 SUPPLEMENTS

. Supplements listed below, following the “End of Section” designation, are a part of this Section:

0. Controls Schedules:

. Schedule of HVAC Components for Vibration Control.

a. Schedule of HVAC Components for Wind Control.

1. Controls Tables:

. Table 15050-A - HVAC System Components.

a. Table 15050-B – Not Used.

b. Table 15050-C – Not Used.

c. Table 15050-D – Not Used.

d. Table 15050-E – Not Used.

e. Table 15050-F - Minimum Deflection Guide.

2. Attachment 15050-A – Professional Design Services Performance Certification.

END OF SECTION

CONTROLS SCHEDULES FOR SECTION 15050

Section 15050 **Schedule of HVAC Components for Vibration Control**		
Item No.	**Component**	**Notes**
1	VRF System Heat Pumps Indoor Units (IDU-1 and IDU-2)	
2		
3		
4		
5		
6		
7		
8		
9		
10		

NOTES:

Section 15050 **Schedule of HVAC Components for Wind Control**		
Item No.	**Component**	**Notes**
1	Split System Heat Pump Condensing Units (HPCU-1)	
2	VRF System Heat Pump Condensing Units (ODU-1)	
3		
4		
5		
6		
7		
8		
9		
10		

NOTES:

SECTION 15050 TABLES

Abbreviations for Tables 15050-A, 15050-B, 15050-C, and 15050-D:

ISOL	Vibration Isolator
DEFL	Deflection
MTNG	Mounting
MDG	Minimum Deflection Guide – Table 15050-F

General Notes (G) for Tables 15050-A, 15050-B, 15050-C, and 15050-D:

Note G1: For variable speed Components with an operating speed below 600 rpm, select isolation deflection from Table 15050-F, Minimum Deflection Guide.

Note G2: Determine static deflection based on Table 15050-F, Minimum Deflection Guide.

Note G3: Deflections indicated are minimum at actual load and shall be selected for Supplier's nominal 5-, 4-, 3-, 2- and 1-inch deflection spring series; rpm is defined as lowest operating speed of Component.

Note G4: Single stroke compressors may require inertia bases with thickness greater than 14-inch maximum specified for Base B-2. Inertia base mass shall be sufficient to maintain double amplitude for 1/8-inch.

Note G4: For floor-mounted fans, substitute base Type B-2 for Class 2 or 3 and fan having static pressure over five inches of water column.

Note G5: Indoor utility sets with wheel diameters less than 24 inches need not have deflections greater than 0.75 inches.

Note G6: For Components with multiple motors, horsepower classification applies to largest single motor.

Reference Notes (R) for Tables 15050-A, 15050-B, 15050-C, and 15050-D:

Note R1: For roof applications, use base Type B-5.

Note R2: Curb Type B-3 shall use sound barrier RPFMA when there is no concrete underneath rooftop units. Curbs can be used for return plenums. (See Option No. 1 under Type B-3 base in Paragraph 2.5 of this Section.)

Note R3: Where curbs require supply and return sound attenuation package, use Type SRRFMA. (See Option No. 2 under Type B-3 base in Paragraph 2.5 of this Section.)

Note R4: Units may not be capable of point support. Refer to separate Specification Section for Component. If base is not specified in that Section and external isolation is required, provide Type B-1 base under this Section for entire unit.

Note R5: Use Type B-6 where Non-Isolated support is required.

Note R6: Use Type B-4 where Non-Isolated curbs are used.

TABLE 15050-A - HVAC SYSTEM COMPONENTS										
			Mounted on Soil Supported Slab				Mounted on Suspended Slab and Floor or Roof System			
COMPONENT	HP, CLASS, OR SIZE	MTNG	ISOL	DEFL (in.)	BASE	RESTR	ISOL	DEFL (in.)	BASE	RESTR
VRF Indoor unit (IDU-1 & IDU-2)		Clg	D	0.30	--	V	D	0.30	---	V

Table 15050-F – MINIMUM DEFLECTION GUIDE	
rpm	**MINIMUM REQUIRED DEFLECTION (inches)**
Less than 400	3.5
401 to 600	2.5
601 to 900	1.5
Over 900	0.75

ATTACHMENT 15050-A

Professional Design Services Performance Certification

My name is
_____.

My Florida professional engineering/architecture license number is
_____.

My license expires _____,
20_____.

The Project for which I have performed professional design services is described as_____.

The Specification Section(s) under which I have performed my services is/are _____.The name and address of the individual or entity for whom I have performed professional design services is:

_____
_____
_____
_____

I hereby certify that, to the best of my knowledge, information, and belief, I have performed or supervised performance of the professional design services hereunder, and that said services have been performed in accordance with Laws and Regulations and in accordance with the standard of care currently expected of professional engineers/architects performing similar services for Projects of similar size and complexity in [State of Project Location].

_____ _____

Date Signature

_____

Type or Print Name

_____

Name of Firm

_____

Street Address

_____

City/State/Zip Code

[PROFESSIONAL SEAL]

Telephone: _____ Fax: _____

END OF SECTION 15050

SECTION 15060

HANGERS AND SUPPORTS - HVAC

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. CONTRACTOR shall provide all hangers, supporting devices and appurtenances shown, specified or required for pipes, fittings, valves and other in-line equipment.

B. Included in this classification are rod hangers; clevis hangers, spring hangers; stanchion, roller and pipe pole supports and saddle stands; supports of structural steel; concrete saddles, concrete anchor blocks and bases, and all necessary guides, restraints, fastening devices, anchor bolts, pipe anchors and appurtenances.

C. CONTRACTOR shall provide all temporary pipe supports required during construction.

D. CONTRACTOR shall design all piping support systems in accordance with the requirements of this Specification unless otherwise shown or specified.

1.02 RELATED SPECIFICATIONS

A. Specification 03300 - Cast-in-Place Concrete

B. Specification 05500 - Metal Fabrications

C. Specification 09900 - Painting

1.03 REFERENCES

A. The Manufacturers Standardization Society of the Valve and Fitting Industry:
   1. MSS SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture.
   2. MSS SP-69 - Pipe Hangers and Supports - Selection and Application.
   3. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
   4. MSS SP-90 - Guidelines on Terminology for Pipe Hangers and Supports.

B. Federal Specification, FS W-H-171 - Hangers and Support, Pipe.

C. Underwriter's Laboratories, Inc., Standard UL-203 - Pipe Hanger Equipment.

D. ASTM A 36 - Standard Specification for Carbon Structural Steel.

E. ASTM A 48 - Standard Specification for Gray Iron Castings.

F. ASTM A283 - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes and Bars.

G. ASTM A778 - Standard Specification for Welded, Unannealed Austenitic

Mott MacDonald Restricted

H. ASME - B31.1 - Power Piping.

I. IBC - International Building Code, Latest Edition. Section 1621

J. EJMA - Expansion Joint Manufacturers Association.

K. NFPA 13 - Installation of Sprinkler Systems.

L. ASCE 7, latest edition - Section 9.6.

1.04 DESIGN REQUIREMENTS

A. CONTRACTOR shall provide hangers and supports of sufficient strength to maintain the pipelines and appurtenances in proper position and alignment under all operating conditions.

B. All hangers and supports shall conform to the applicable requirements of ASME B31.1, MSS SP-58, SP-59, SP-69 and SP-90, except as modified herein, and be of standard manufacture wherever possible, and best suited for the service required.

C. Unless otherwise approved, all hangers, supports and concrete inserts shall be listed with Underwriters' Laboratory, Inc.

D. General Requirements:
1. Where practicable, piping shall be run in groups and parallel to building walls. A minimum clearance of one inch shall be provided between pipe and other work.
2. Hangers or supports shall be provided at all locations where piping changes direction.
3. Hangers and supports shall be capable of adjustment after placement of piping.
4. Types of hangers and supports shall be kept to a minimum.
5. Suspended or supported ductile iron pipe shall have a hanger or support adjacent to each hub or flanged end.
6. Vertical piping shall be supported at each floor and between floors by stays or braces to prevent rattling and vibration.
7. Hanger rods shall be straight and vertical. Chain, wire, strap or perforated bar hangers shall not be used. Hangers shall not be suspended from piping.
8. Contact between dissimilar metals shall be prevented by use of copper plated, rubber or vinyl coated hangers or supports.
9. Hangers and supports shall provide for expansion and contraction throughout the full operating temperature range.
10. Any required pipe supports, for which the supports called for in this Specification are not applicable, shall be fabricated or constructed from standard stainless steel shapes, concrete and anchor hardware, and shall be subject to the approval of ENGINEER.
11. Where hanger or support spacing does not correspond with joist or rib spacing, structural steel channels shall be attached to joists or ribs, and the pipes suspended therefrom.

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12. All hanger rods shall be double nutted at each hanger or support.
13. All threaded assemblies shall be double nutted or provided with pinned nuts. Alternately, tack welding of bolted assemblies may be acceptable unless provisions for vertical adjustment is required.
14. Except where otherwise shown or required, horizontally valves 6-inches and larger shall be supported on each side of the valve, by pipe hangers or supports.
15. At all flexible couplings, supports shall be placed on each side and as close to the coupling as possible. Supports shall be the guide type which prevent axial movement from resulting in pipe deflection and misalignment.
16. Supports, anchorage and guidance for grooved end pipe shall be in accordance with the applicable sections of these specifications and the recommendations of the manufacturer.

1.05 SUBMITTALS

A. Submittals shall be in accordance with the requirements Section 01300 Submittals.

B. CONTRACTOR shall submit the following for approval:
   1. Detailed working drawings showing all hangers and supports for each piping system. Working drawings shall show location, installation, material, loads, forces, stresses and deflections of all hangers and supports. Reaction forces imparted to structures to which hangers and supports are attached shall be shown.

C. CONTRACTOR shall submit the following product information for approval:
   1. Manufacturer's catalogues and engineering data on all hangers and supports.
   2. Load ratings.
   3. Materials.
   4. Installation details.

D. CONTRACTOR shall provide detailed drawings of each pipe support. Each drawing shall contain enough information to verify the pipe support design and to allow the manufacture of the device. At a minimum, the CONTRACTOR shall submit:
   1. Scaled details of the device with dimensions.
   2. A table of applied forces and moments.
   3. A complete bill of materials.
   4. An isometric showing the applied forces and moments.
   5. Detailed connections to existing structure.
   6. Shop and field welds.

E. Each submittal shall have the following:
   1. A unique identification number and revision level.

1.06 DELIVERY, STORAGE, AND HANDLING

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A. Equipment and materials shall be delivered to the site to insure uninterrupted progress of the Work. Pipe hanger inserts which are to be embedded in cast-in-place concrete shall be delivered in ample time not to delay the Work.

B. Equipment and materials shall be stored to permit easy access for inspection and identification, and shall be kept in covered storage off the ground, using pallets, platforms or other supports. They shall be protected from condensation, corrosion and deterioration.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Pipe hangers, supports and appurtenances shall be standard products of the manufacturers listed in the Specifications.

B. Each type of hanger and support shall be the product of a single manufacturer.

2.02 MATERIALS

A. Materials for hangers and supports of metallic construction shall conform to ASME B31.1 and to the following standards:
   1. Structural Steel, ASTM A 36 and A 283.
   2. Iron Castings, ASTM A 48 (Class No. 35).
   3. Stainless Steel, ASTM A 276
      a. Type 316 stainless steel for non-welded items.
      b. Type 316L stainless steel for welded or fabricated items.
      c. Tensile Strength 70,000 psi minimum.
      d. Yield Strength 25,000 psi minimum.
      e. Elongation in 2 inches 35 percent.
      f. Reduction of area 45 percent.
   4. Stainless Steel Pipe and Tube, ASTM A 778, Type 316L stainless steel.

B. Pipe supports, hangers, brackets, guides, restraints, rods, bolts, nuts and anchors shall be Type 316 stainless steel. Concrete inserts shall be of malleable iron with galvanized finish.

C. Pipe rolls, including stands and bases, shall be of cast iron, hot-dipped galvanized conforming to ASTM A123.

D. Only new materials shall be provided.

E. Hangers and supports shall conform to MSS-SP-58, Table 2.

2.03 HANGERS AND SUPPORTS

A. Hangers and supports shall comply with MSS SP-58.

B. All hangers and supports shall allow minimum 3-inches of vertical adjustment.

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C. Hangers and Supports shall be of the following types:
   1. Hangers for Single Pipes:
      a. Single pipes shall be supported by hangers suspended by rods from structural steel members, inserts in concrete ceilings and beams, bottom of trapeze hangers and wall mounted steel angle brackets. The strength of the rod shall be based on its root diameter.
      b. Except for piping subject to thermal expansion and contraction or as otherwise specified in the Specifications, pipe hangers shall be adjustable clevis type MSS SP-58 Type-1.
      c. Piping subject to thermal expansion and contraction shall be supported on rollers.
   2. Hangers or Supports for Multiple Pipes:
      a. Multiple pipes, running parallel in the same horizontal plane, and adjacent to each other, shall be suspended by trapeze type hangers or supported on wall brackets. Trapeze hangers shall consist of channel sections supported from threaded rods or attached to concrete walls, columns or structural steel support members.
      b. Except as otherwise specified herein, pipe anchors used for attaching pipe to trapeze or multiple pipe wall brackets, shall be anchor or pipe chairs as required.
   3. Supports for Single Pipe:
      a. Single pipes located in a horizontal plane close to the floor shall be supported by one of the methods specified herein or as shown on the Contract Drawings.
      b. Pipes shall be supported by adjustable stanchions, pipe saddle or roll supports with "U" bolts. Stanchions shall provide at least 4-inches adjustment and be flanged-mounted to floor.
      c. Stanchions and saddle stands shall be of Type 316L stainless steel.
      d. Pipe pole supports for pipe runs above ground, out-of-doors, and where otherwise required, shall consist of a suitable length of stainless steel pipe set upright in at least four feet of concrete; two stainless steel angles secured to the top of the pipe, at right angle and on each side; a stainless steel plate welded to the top of the angles to serve as a horizontal support for the pipes. Supports shall be provided with attachments in the form of stands, clamps, rolls, rods or similar devices of the screw adjustable type in the vertical direction.
      e. Where specified or shown, column supports of built-up welded stainless steel shall be provided, as approved by the ENGINEER.
      f. Pipe rollers shall be cast ductile iron, unless otherwise shown or specified in the Specifications. Hardware and appurtenances shall be stainless steel.
   4. Wall Supported Pipes: Single or multiple pipes located adjacent to walls, columns or other structural members, and an excessive distance from ceilings or underside of beams, shall be supported using stainless steel wall brackets, MSS SP-58 Type 32 or 33. Where pipes rest on top of bracket pipe supports, attachments shall meet the requirements specified under Paragraph 2.b above.

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5. Supports for Base Elbows: Where pipes change direction from horizontal to vertical through a bend, a welded or cast base anchor support shall be installed at the bend to carry the load.
6. Supports for Vertical Pipes: Pipe riser clamps shall be used to support all vertical pipes extending through floor slabs. Riser clamps shall be MSS SP-58 Type 42 or 8. Insulation shall be removed from insulated pipes prior to installing riser clamps.
7. Supports for Pipelines with Thermal Expansion:
    a. Pipe rolls for single rod hangers: Stainless steel frame construction, ductile iron roller and stainless steel roller rod provided with threaded nuts; vertical adjustment permitted; for pipe sizes 6 inches or less unless otherwise approved.
    b. Pipe rolls for double rod hangers: Ductile iron roller, stainless steel roller rod, malleable iron threaded sockets which permit vertical adjustment.
8. Supports for Copper and Brass Pipes: All copper and brass pipe supports shall be specifically manufactured for use with copper and brass pipe. Hangers shall be provided with a copper finish.
9. Concrete Supports:
    a. Where pipeline or mechanical equipment is shown, specified or required to be supported on concrete supports, supports shall be as specified herein.
    b. Concrete supports for equipment shall be of a size and mass that will resist all forces, both static and dynamic, which may be developed by the equipment.
    c. Concrete supports for pipe, fittings, valves and appurtenances shall be designed to carry the weight of the pipeline and appurtenances. Cradles and anchor blocks shall safely withstand all stresses imposed by the pipelines, under all operating conditions. Concrete cradles shall be shaped to fit the contour of the pipe.
    d. Concrete supports shall be anchored to the floor of main structures by doweling or other approved means. Anchor bolts, extension plates, saddle yokes and other hold-down devices in concrete bases shall be placed before pouring of concrete. Expansion bolts shall not be used on new concrete supports except with the specific approval of the ENGINEER.
    e. Concrete supports shall be not less than Class 25 as specified in Specification 03300 - Cast-in-Place Concrete.

2.04 ACCESSORIES

A. Hanger Rods:
1. Material shall be Type 316 stainless steel. Maximum allowable working stress shall be 5,800 psi, calculated based on the root diameter.
2. Rods shall have a square head nut on top and running thread on bottom end.
3. Hanger rods for pipe hangers shall be sized in accordance with the table located in 3.02, HANGERS AND SUPPORTS INSTALLATION.

B. Concrete Inserts, Attachment Plates and Clamps:
1. Hanger rods up to 7/8-inch diameter shall be attached to new concrete structures using concrete inserts MSS SP-58, Type 18. Inserts shall be

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malleable iron with galvanized finish. The use of steel inserts is prohibited. Design of the inserts shall permit the rods to be adjusted laterally in one plane and to lock the rod nut or head to the body. The inserts shall be provided with openings or recesses to receive reinforcing rods. To facilitate installation, slots shall be provided in the exposed flanges of the insert. Inserts shall be rated to safely carry the maximum load which can be supported by the hanger rod.

2. Hanger rods larger than 7/8-inch diameter shall be attached to new concrete by means of approved hook anchors as shown on the Contract Drawings.
3. Hanger rods shall be attached to existing concrete structures using stainless steel expansion anchors as specified in Specification 05501.
4. Steel beam clamps shall be malleable iron and conform to MSS SP-58 Type 28 or 29 for wide flange or I-beams, and Type 20 for channel sections or where it is necessary to locate the hanger rod off the beam centerline.
5. Steel U-shape beam attachments welded to the underside of beams, and welded steel brackets fastened to structural steel columns, shall be subject to specific approval of the Structural Steel and Pipe Supports Working Drawings.

2.05 PIPE INSULATION PROTECTION

A. CONTRACTOR shall furnish steel protection saddles on all supports for insulated pipe.
   1. For pipe sizes less than 12 inches in diameter, provide saddles of No. 14 U.S. gauge stainless steel curved 180 degrees for use with roller hangers or structural trapeze hangers and of No. 16 U.S. gauge stainless steel curved 120 degrees for use in clevis hangers. Saddles shall be at least 12-inches long. Saddle gripping side edges shall be turned up at least to the thickness of insulation.

2.06 SADDLES

A. Before placing the saddles, saddles shall be filled with either insulating cement or high density insulation cut to fit. For vapor barrier insulation, the barrier must be maintained; contact between hanger and support and bare pipe will not be permitted.

B. Anchors and sway braces shall be provided when required to hold the pipelines and equipment in position or alignment. Pipe anchors and braces for rigid fastening to the structures shall be attached to stainless steel anchor plates and anchor bolts set into the forms when placing concrete of new structures. Brackets and braces shall be attached to existing concrete structures with through bolts or expansion anchors.

C. Anchors, guides, and restraints shall be provided for the proper operation of pipeline expansion joints.

D. Cast iron anchors shall be provided with stainless steel straps on piping, except where anchors form an integral part of pipe fittings and couplings or where an anchor of special design is required or shown on the Contract Drawings.

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E. All pipe anchors, guides and restraints shall be designed to conform to ASME B31.1.

2.07 INSPECTION

A. The Owner may elect to conduct shop inspections. The inspections may include but not be limited to: mechanical and chemical testing, material sampling, material certifications, traceability of parts, blasting and painting, visual and dimensional inspection, and free iron contamination check on stainless steel parts.

PART 3 - EXECUTION

3.01 GENERAL

A. Hangers, supports, and accessories shall be located within maximum span lengths specified to support continuous pipeline runs unaffected by concentrated loadings.

B. Hangers or supports shall be provided at all locations where piping changes direction.

C. Hangers and supports shall be located to prevent vibration or swaying and to provide for expansion and contraction.

D. Hangers rods shall be straight and vertical. Chain, wire, strap or perforated bar hangers shall not be used. Hangers shall not be suspended from piping.

E. Concrete embedded items shall be installed before concrete placement.

F. Embedded items shall be fastened securely to prevent movement during concrete placement.

G. Hanger and support units installation methods shall be in accordance with manufacturer's recommendations.

H. Hangers and supports shall be adjusted and grout placed to bring pipelines to specified elevations.

3.02 HANGERS AND SUPPORTS INSTALLATION

A. Supports and Hangers for Horizontal Pipes:
   1. Supports and hangers for all piping shall be placed no farther apart than what is shown in Table 15060-1 and 15060-2, Recommended Hanger Spacing and Rod Size for Steel Pipe and Copper Tubing shown below, unless otherwise shown or specified. Tables are based on MSS SP-69 Tables 3 and 4. Spacing and capacities are based on water filled pipe plus 50 lbs. /ft. dead load. Closer hanger spacing may be required where additional valves and fittings increase the load.

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TABLE 15060-1

Recommended Hanger Spacing and Rod Size for Steel Pipe				
Nominal Pipe Size (inches)	Maximum Span* (feet)	Recommended Hanger Rod Sizes (single rod – inches)	Recommended Hanger Rod Sizes (double rod – inches)	Maximum Load Per Hanger (lbs.)
3/4”	7	3/8”	3/8”	300
1”	7	3/8”	3/8”	300
1 1/4”	7	3/8”	3/8”	300
1 1/2”	9	3/8”	3/8”	300
2”	10	3/8”	3/8”	325
2 1/2”	11	1/2”	3/8”	350
3”	12	1/2”	3/8”	400
3 1/2”	13	1/2”	3/8”	450
4”	14	5/8”	1/2”	850
5”	16	5/8”	1/2”	950
6”	17	3/4”	5/8”	1075
8”	19	7/8”	5/8”	1350
10”	22	7/8”	5/8”	1750
12”	23	7/8”	3/4”	2200
14”	25	1”	7/8”	2500
16”	27	1”	7/8”	3075
18”	28	1”	7/8”	3700
20”	30	1 1/4”	1”	4425
24”	32	1 1/4”	1”	6050

*For hanger spacing greater than 10’-0-inch, many codes require pipe hangers to be spaced a maximum of every 10’ regardless of size. CONTRACTOR shall check with local codes and comply as applicable.

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TABLE 15060-2

Recommended Hanger Spacing and Rod Size for Copper Tubing		
Nominal Tubing Size (inches)	Maximum Span* (Feet)	Recommended Hanger Rod Sizes (inches)
1/2”	5	3/8”
3/4”	5	3/8”
1”	6	3/8”
1 1/4”	7	3/8”
1 1/2”	8	3/8”
2”	8	3/8”
2 1/2”	9	1/2”
3”	10	1/2”
3 1/2”	11	1/2”
4”	12	1/2”
5”	13	1/2”
6”	14	5/8”
8”	16	3/4”

*For hanger spacing greater than 10’-0-inch, many codes require pipe hangers to be spaced a maximum of every 10’ (3.048 meters) regardless of size. CONTRACTOR shall check with local codes and comply as applicable.

2. Additional spacing requirements:
   a. Ductile Iron, Steel and Stainless Steel Pipe:
      1) Maximum spacing in accordance with Table 3 of MSS-SP-69. The designer should check the capacity of the steel or building structure to which the hanger or support is attached, and adjust the maximum spacing accordingly.
      2) In addition, ductile iron pipe shall have a minimum of two supports per length and shall have a hanger or support adjacent to each end.
   b. Tubing less than 1-inch diameter: In accordance with best piping practice and ASME B31.1, and as approved by the ENGINEER.
3. Additional supports shall be placed immediately adjacent to any change in piping direction, at equipment, and on both sides of valves, expansion joints and couplings.

B. Supports for Vertical Piping:
   1. Riser clamp shall be placed under hub, fitting or coupling with approved solid bearing on steel sleeve.
   2. Where riser clamps are used with plastic piping they shall be modified so as not to exert any compressive forces on the pipe.

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3. Vertical piping shall be supported at each floor and between floors by stays or braces to prevent rattling and vibration. Maximum spacing shall not exceed 25 feet.
4. Base elbows or welded equivalent shall be provided at vertical piping bases.
5. Top support shall have a horizontal connection, and provide for pipe expansion.

C. Pipelines installed under plumbing work shall be spaced in conformity with the requirements of the International Building Code or as specified in the Specifications.

3.03 PAINTING AND COATING

A. Painting shall be in conformity with Specification 09900 - Painting.

B. Surfaces of hangers and supports in contact with aluminum, brass, plastic and copper pipelines or pipeline equipment shall be protected with an approved plastic coating to prevent abrasion. Touch-up shall be provided in the field, as required. Coating shall be applied in accordance with the manufacturer's recommendations, and shall be free from spots and brush marks, to the satisfaction of the ENGINEER.

3.04 TESTING

A. All pipe support and restraining systems shall be installed and secured prior to the testing or activation of the pipeline on which they are installed.

B. All pipe support systems shall be tested for compliance with the Specifications. After installation, each pipe support system shall be tested in conjunction with the respective piping pressure tests. Tests shall include cycling the piping system to duplicate operating conditions. If any part of the pipe support system proves to be defective or inadequate, as evidenced by vibration or excessive movement, it shall be repaired or augmented at no additional cost to the OWNER.

END OF SECTION 15060

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SECTION 15064

PLASTIC PIPE AND FITTINGS

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals required and install the plastic piping, fittings, and appurtenances as specified herein and installed in the locations as shown on the Drawings.

B. All buried piping on the project with a diameter 4-inches and greater shall be restrained joint type. Locate wire shall be installed for all buried pipe with nominal diameter of 6-inches and greater.

1.02 RELATED WORK

A. Excavation and backfill for yard piping is included in Section 02221.

B. Painting is included in Section 09900.

C. Pipe supports systems are included in Section 15090.

D. Valves and appurtenances are included in Section 15100.

1.03 DESCRIPTION OF SYSTEM

A. Piping shall be installed in the locations as shown on the Drawings.

1.04 QUALITY ASSURANCE

A. All plastic pipe, fittings, and appurtenances shall be furnished by a single manufacturer who is fully experienced, reputable, and qualified in the manufacture of the items to be furnished. The equipment shall be designed, constructed, and installed in accordance with the best practices and methods and shall comply with these specifications.

B. All pipe shall be stored out of the sunlight. Temporary shading shall be provided. The pipe shall be stored at ambient outdoor temperatures. Gaskets shall be stored in a cool, dark location, and shall not come into contact with petroleum products.

C. Inspections of the pipe or storage methods may be made by the ENGINEER or OWNER and may be subject to rejection at any time on account of failure to meet the requirements. Rejected pipe shall be marked and removed from the site.

1.05 SUBMITTALS

A. Shop drawings shall be submitted to the ENGINEER for approval in accordance with Section 01300 Submittals and shall include dimensioning and technical specification for all piping to be furnished.

B. Submit shop drawings and scaled piping layout drawings for all pipe and fittings supplied for each piping system. Layouts should include pipe type, fittings, and elevations.

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C. Submit procedures and certified test reports confirming that pipe has been manufactured in accordance with ASTM and AWWA standards specified herein.

1.06 TOOLS

A. Special tools, solvents, lubricants, and caulking compounds required for normal installation shall be furnished with the pipe.

PART 2 – PRODUCTS

2.01 GENERAL

A. All pipe shall be bundled or packaged in such a manner as to provide adequate protection for the ends, threaded, or flanged, during transportation from the manufacturer.

B. All piping for potable water shall be blue, all piping for drain or sewer shall be green, and all piping for reclaimed water shall be purple.

2.02 POLYVINYL CHORIDE (PVC) PIPE

A. All PVC pipe less than 4-inch in diameter shall be suitable for field cutting, welding, bending and coupling and shall be Schedule 80 unless otherwise shown on the Drawings and of the sizes as shown on the Drawings. Pipe supports shall be provided where shown on the drawings.

B. All pressure pipe 4 inches through 16 inches shall have a dimension ratio (DR) of 18. All pressure pipe larger than 16-inch in diameter shall have a DR of 25. PVC pressure pipe 4-inch through 12-inch shall conform to AWWA C900. PVC pressure pipe 14-inch and larger shall conform to AWWA C905. PVC gravity sewer pipe larger than 4-inch in diameter shall have a SDR of 26. PVC gravity pipe 4-inch through 15-inch shall conform to ASTM D3034. PVC gravity pipe 18-inch and larger shall conform to ASTM F679. The pipe shall be made of PVC compounds Class 12454-A or 12454-B as defined in ASTM D1784. Each pipe shall be marked with the manufacturers name, trademark, size, material code, pressure class, AWWA designation number. When used for potable water service, a seal of the testing agency confirming compliance with all applicable standards.

C. Fittings for pipe less than 4 inches shall be the socket type for solvent welded joints as designated in ASTM D-2467, except where threaded as shown on the Drawings, and as designated in ASTM D-2464, or flanged as shown on the Drawings, and shall be compatible with the pipe material where installed. Flanges shall be furnished with 1/8-inch thick full-faced Teflon, Viton, or ENGINEER approved equal gaskets. Flange bolts and nuts shall be ASTM A276, Type 316 stainless steel.

D. Fittings for pipe 4 inches and larger shall be ductile iron with restrained push-on or mechanically restrained configurations compatible with the type PVC utilized.

E. Caulking for plastic pipe in wall sleeve shall be by a mechanical, modular, rubber

sealing element placed in between the sleeve and pipe and expanded to make a tight fit or other method approved by the ENGINEER.

F. Expansion joints shall have integral duck and rubber flanges. They shall have individual solid steel ring reinforcement with a carcass of highest grade woven cotton or acceptable synthetic fiber. Joints shall be constructed of pipeline size and to meet working pressure and corrosive conditions similar to the line where installed. They shall be of a filled arch-type construction with a minimum of three arches per joint. All joints must be finish-coated with Hypalon paint to prevent ozone attack. They shall be Style 500 as manufactured by Mercer Rubber Co. of Trenton, New Jersey, or equal.

G. All PVC pipe and materials coming into contact with raw or potable water service shall be certified NSF 14 and 61 approved.

2.03 HIGH DENSITY POLYETHYLENE (HDPE)

A. All HDPE pipe shall be DR11 and shall conform to AWWA C906 and ASTM D2447, and all fittings shall conform to ASTM D3261.

B. Pipe shall be manufactured from HDPE base resin conforming to grade 34 (PPI PE 3406) or better in accordance with ASTM D2447. The pipe shall have a minimum hydrostatic design stress of 630 psi at 73 degrees F and be suitable for field cutting and heat fusion joining.

C. Joints for HDPE shall be butt heat fusion made in accordance with D2657.

D. Mechanical connections to valves and piping shall be made in accordance with the manufacturer's recommendations. Flanged connections shall consist of the following:
   1. Stainless steel backup, polyethylene flange shall be thermally butt fused to the stub end of the pipe.
   2. A type 316 SS backup ring on both sides of the connection shall be used as approved by the ENGINEER.
   3. Flange connections shall be provided with a full-face neoprene gasket.

2.04 PLASTIC TUBING

A. Plastic tubing shall be clear, flexible, non-cracking with a wall thickness that is adequate for the pressures involved and of the sizes as shown on the Drawings.

B. All plastic tubing shall be chemically inert, resistant, and compatible for the chemical intended for its use.

2.05 LOCATE WIRE

A. Utility marking tape shall be 3-inch wide and 4-mil thick per ASTM D2103 with a 2,750-psi tensile strength per ASTM D882.

B. Tape shall have adhesive backing and industrial standard repeatable message.

C. External color of locate wire shall be blue for potable water, green for sewer, and

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pantone purple 522C for reuse.

D. Locate wire shall be 10-gauge, single strand, UF rated for direct bury, copper wire with 30 mil insulation.

PART 3 – EXECUTION

3.01 INSTALLATION

A. The installation of plastic pipe shall be strictly in accordance with the manufacturer's technical data and printed instructions.

B. Joints for plastic pipe shall be solvent welded except flanged or threaded where required. In making solvent welded connections, clean dirt and moisture from pipe and fittings, bevel pipe ends slightly with emery cloth, if necessary, and apply solvent cement of the proper grade. Expansion joints shall be installed every 50 feet on long runs and in every straight run longer than 15 feet.

C. Installation of valves and fittings shall be strictly in accordance with manufacturer's instructions. Particular care shall be taken not to overstress threaded connections at sleeves. In making solvent weld connections the solvent shall not be spilled on valves or allowed to run from joints.

D. All piping shall have a sufficient number of unions to allow convenient removal of piping and shall be as approved by the ENGINEER.

E. Where plastic pipe passes through wall sleeves, joints shall be sealed with a mechanical sealing element as shown on the Drawings.

F. All plastic pipe to metal pipe connections shall be made using flanged connections. Metal piping shall not be threaded into plastic fittings, valves, or couplings, nor shall plastic piping be threaded into metal valves, fittings, or couplings.

G. Concrete inserts for hangers and supports shall be furnished and installed in the concrete as it is placed. The inserts shall be set in accordance with the requirements of the piping layout and the CONTRACTOR shall verify the locations from approved piping layout drawings and the structural drawings. Pipe hangers and supports shall be as specified in Section 15090 and as detailed on the drawings.

3.02 FIELD PAINTING

A. Pipe exposed to view shall be painted as specified in Section 09900. CONTRACTOR shall coordinate with their elected pipe MANUFACTURER to ensure they have no issues with the specified painting. ENGINEER will assist in identifying pipe contents, direction of flow, and all else required for proper marking of pipe.

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3.03 INSPECTION AND TESTING

A. All piping shall be tested as per Paragraph 1.4.2.5 of the SJCUD Standard Specifications, latest version.

B. The test pressures and temperatures for the various pipe lines shall be as follows:
1. Drain and gravity sewer piping: 20 psi at ambient temperature
2. All other piping: 150 psi for water mains or reclaimed water mains, 100 psi for force mains

3.04 LOCATE WIRE TESTING

A. Locate wire shall be brought to grade within a valve box or locating station box at 200 foot intervals or less. Locate wire shall be installed in a box along the pipeline in either the 5:00 o'clock or 8:00 o'clock position relative to the pipe. Connection or splices underground which are not inside a locate box or valve box is not allowed.

B. Testing shall be performed by a person or company that has been certified by the manufacturer of the approved testing equipment as proficient in the use of the equipment. The certified tester shall be approved by SJCUD and the ENGINEER. A SJCUD representative may elect to be present during the testing period.

C. The CONTRACTOR shall provide the tester with a copy of the yard piping plan that has been marked up by the CONTRACTOR to identify pipes where locate wiring has been installed. The tester shall trace the entire length of pipe and mark any piping location variations from the marked-up plans. The depth to top of pipe shall be recorded at 50 foot intervals.

D. A final locate wire report shall be submitted to SJCUD and the ENGINEER for review and approval. The report shall include a signed and sealed statement from the tester that certifies all installed wire was successfully sounded and traced with no open breaks. The report shall include all field notes, breaks found/repaired, depths, and other applicable field remarks by the tester. The report shall be furnished prior to substantial completion of the project.

END OF SECTION 15064

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SECTION 15072

DUCTILE IRON PIPE AND FITTINGS

PART 1 – GENERAL

1.01 SCOPE

A. The work under this Section of the specifications shall include all materials, equipment, and labor for furnishing, laying, installing, testing, and disinfecting the piping work and appurtenances herein under described and as shown on the Contract Drawings.

B. The CONTRACTOR shall furnish ductile iron pipe, fittings, accessories, and appurtenances necessary for installation, including but not limited to gaskets, nuts, and bolts for flanged joints; pipe supports; tie rods; and flexible couplings.

C. All buried piping on the project shall be restrained joint type. Locate wire shall be installed for all buried pipe with nominal diameter of 6-inches and greater.

1.02 RELATED WORK

A. Mechanical equipment, pipe supports, sleeves, couplings, valves and appurtenances are included in respective sections of Division 11 and 15.

B. Painting, except as specified herein, is included in Division 9.

1.03 QUALITY ASSURANCE

A. Dimensions shown on Contract Drawings are approximate only. CONTRACTOR shall verify all piping geometry in the field and shall be responsible for ensuring proper alignment and fit of all piping consistent with the intent of the Contract Drawings.

1.04 SUBMITTALS

A. Shop drawings and manufacturer's literature shall be promptly submitted to the ENGINEER for approval in accordance with Section 01300.

B. The following items shall be submitted before delivery of pipe or fittings:
   1. Certification by the manufacturer or supplier that the pipe furnished for this project meets all pertinent AWWA and, if coming into contact with potable water, NSF 61 Standards, latest editions.
   2. Certifications of compliance with applicable standards for all piping.
   3. Pipe laying schedule or assembly drawings which indicate overall dimensions, lengths of restrained joint pipe, the specific number of each pipe and fitting and the location and direction of lay of each pipe identified by mark number. Pipe laying schedules shall be submitted for all piping systems and shall include elevations of proposed piping.
   4. Catalog cuts and installation instructions for all restrained joints including boltless restrained joint pipe and grooved end joint pipe for ductile iron pipe.
   5. Certification that all bolts to be furnished conform to the referenced standards and are manufactured in the United States of America.

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6. Shop drawings and schedules completely detailing and locating wall pipes shall be submitted for approval prior to their fabrication and well in advance of the concrete work.

1.05 DELIVERY, STORAGE, AND HANDLING

A. The Manufacturer shall legibly mark all pipe and specials in accordance with the approved laying schedules and marking diagram. Each pipe shall be numbered in sequence and said number shall appear on the laying schedule and marking diagram in its proper location for installation.

B. The CONTRACTOR shall carefully examine all material for defects. Material which is known, or thought, to be defective shall not be installed.

C. The ENGINEER reserves the right to inspect all material and to reject all defective material shipped to the job site or stored on the site. Failure of the ENGINEER to detect damaged material shall not relieve the CONTRACTOR from his total responsibility for the completed work if it leaks or breaks after installation. Lay all defective material aside for final inspection by the ENGINEER to determine if corrective repairs may be made, or if the material is to be rejected. The ENGINEER shall determine the extent of the repairs.

D. CONTRACTOR shall classify defective pipe prior to ENGINEER's inspection as follows:
   1. Damage to interior and/or exterior paint seal coats.
   2. Damage to interior cement-mortar lining.
   3. Insufficient cement-mortar lining thickness.
   4. Poor quality interior paint seal coat.
   5. Pipe out of round.
   6. Damaged pipe barrel area to a point where pipe class thickness is reduced.
   7. Denting or gouges in plain end of pipe.

E. The CONTRACTOR shall be solely responsible for the safe storage of all material until it has been incorporated in the completed project and accepted by the ENGINEER.

F. Pipe fittings and accessories shall be loaded and unloaded by lifting with hoists or skidding to avoid shock or damage. Under no circumstances shall such materials be dropped. Pipe handled on skidways shall not be skidded or rolled against another pipe. Handling of this material is to be in accordance with AWWA C600.

G. The CONTRACTOR is cautioned to exercise care in handling, loading, unloading, and storing ductile iron pipe and fittings. All ductile iron pipe and fittings shall be stored under cover before use and shall be transported in a vehicle with a bed long enough to allow the length of pipe to lay flat so as not to be subject to undue bending or concentrated external load at any point.

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PART 2 – PRODUCTS

2.01 DUCTILE IRON PIPE

A. General
1. Ductile iron pipe and fittings 3-inch and larger shall be manufactured by U.S. Pipe and Foundry, American Ductile Iron Pipe Company, McWane Pipe Company, or ENGINEER approved equal.
2. Ductile iron pipe shall conform to the latest specifications as adopted by the American National Standards Institute, Inc., (ANSI) and the American Water Works Association (AWWA). Specifically, ductile iron pipe shall conform to ANSI/AWWA C151/A21.51, AWWA C150, and AWWA C111.
3. All buried pipe shall be coated outside with a bituminous coating in accordance with ANSI/AWWA C151/A21.51. Bituminous coating on any exposed piping is not acceptable.
4. Potable water and reclaimed water ductile iron pipe interior shall be cement mortar lined and seal coated in compliance with the latest revision of ANSI/AWWA C104/A21.4. High-speed cement lining (offered by American Pipe) is acceptable with no seal coat. All coatings shall be applied at the place of manufacture prior to shipment to the construction site. The coatings shall be protected throughout construction and shall maintain an approved factory condition free of defect.
5. Wastewater ductile iron pipe shall be coated inside with an approved amine cured novalac epoxy coating. Acceptable coatings include Protecto 401 ceramic epoxy, SP 2000 ceramic epoxy, poly bond plus, or approved equal.
6. Each length of pipe shall be subjected to a hydrostatic proof test by the manufacturer as required by ANSI/AWWA C151/A21.51.

B. Mechanical Joint Pipe
1. Push-on and mechanical joints shall conform to ANSI/AWWA C111/A21.11. All pipe installed on this project shall be furnished with restrained joints.
2. The pipe class of non-flanged pipe shall be as a minimum pressure Class 250. Where indicated on the Drawings, thicker classes shall be furnished.

C. Flanged Pipe
1. Flanged joints for piping shall conform to ANSI/AWWA C110/A21.10 for fittings and ANSI/AWWA C115/A21.15 for pipe. Flanged joints shall not be used in underground installations except where specifically shown on the Drawings.
2. All flanged pipe shall be a minimum of thickness Class 125, unless otherwise indicated on the Contract Drawings or SJCUD Standards Manual.

2.02 DUCTILE IRON FITTINGS

A. General
1. Fittings shall be ductile iron conforming to ANSI/AWWA C110/A21.10, C111/A21.11, C115/A21.15, and/or C153/A21.53. Fittings shall also be certified by ISO 9000 by an accredited ENGINEER.
2. Fittings shall have a minimum working pressure of 250 psi.

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3. Fittings shall be coated on the outside and inside to match the connecting pipes.
4. Fittings shall be manufactured by American Cast Iron Pipe Company, Clow, Tyler Union, U.S. Pipe and Foundry, Star Pipe Products, Sigma Corporation, and Pipe Components Inc.
5. All fittings shall be supplied by one manufacturer.

B. Mechanical Joint Ductile Iron Fittings
1. Mechanical and push-on joints including accessories shall conform to ANSI/AWWA C111/A21.11.
2. All buried steel lugs, rods, brackets and mechanical joint bolts and nuts shall be low alloy steel in accordance with ANSI C111 and shall be given one (1) coat of Koppers #50 coal tar coating prior to backfilling.

C. Flanged Ductile Iron Fittings
1. Flanges for fittings shall meet the requirements of ANSI/AWWA C110/A21.10 and C151/A21.51.
2. All above ground flanged piping shall be provided with 316 stainless steel bolts and nuts.

D. Restrained Joint Fittings
1. Restrained joints may be restrained by utilizing a joint restraint gasket which includes a stainless steel locking segments vulcanized into the rubber gasket. The gasket shall be rated for operating pressures up to 250 psi based on the performance requirements of ANSI/AWWA C111/A21.11.

2.03 DUCTILE IRON PIPE MARKING

A. All ductile iron pipe below ground shall be marked with a minimum 3-inch wide, non-detectable utility marking tape. The utility marking tape shall be installed on the pipe at the 12 o'clock position. Tape shall be 4 minimum millimeter ASTM D2103 thickness and constructed for prolonged use underground, meet industry standard (APWA) color code, tensile strength of 2750 psi (ASTM D882), and industrial standard repeatable message.

2.04 RETAINING RINGS

A. The CONTRACTOR shall maintain, on-site, a suitable supply of field installed retaining rings for ductile iron boltless restrained joints for pipe installations which may require unavoidable field cutting, as approved by the ENGINEER. Field installed retaining rings shall be furnished by the same manufacturer as the pipe and shall have the same pressure rating as factory installed rings.

2.05 RETAINER GLANDS

A. All mechanical joint fittings and valves shall be provided with ductile iron retainer glands. Retainer glands shall be "Megalug" Series 1100 as manufactured by EBAA Iron or equal. Retainer glands shall be supplied complete with torque limiting twist off nuts.

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2.06 LOCATE WIRE

A. Utility marking tape shall be 3-inch wide and 4-mil thick per ASTM D2103 with a 2,750 psi tensile strength per ASTM D882.

B. Tape shall have adhesive backing and industrial standard repeatable message.

C. External color of locate wire shall be blue for potable water, green for sewer, and pantone purple 522C for reuse.

D. Locate wire shall be 10 gauge, single strand, UF rated for direct bury, copper wire with 30 mil insulation.

PART 3 – EXECUTION

3.01 INSTALLATION - GENERAL REQUIREMENTS

A. All pipe shall be laid and maintained to the required lines and depths. Fittings and valves shall be at the required locations with joints centered, spigots and all valve and hydrant stems plumb and otherwise in strict accordance with the Specifications.

B. No deviation shall be made from the required alignment, depth or grade except with the written consent of the ENGINEER.

C. All pipe shall be laid to the depth specified. The depth shall be measured from the final surface grade to the top of the pipe barrel. The minimum pipe cover shall be as shown on the Drawings or as specified in the Specifications.

D. Do not lay pipe in a wet trench, on subgrade containing frost, and when trench conditions are unsuitable for such work. If all efforts fail to obtain a stable dry trench bottom and the ENGINEER determines that the trench bottom is unsuitable for trench foundation, he will order in writing the kind of stabilization to be constructed.

E. Thoroughly clean the pipes and fittings before they are installed and this material shall be kept clean until the acceptance of the completed work. Lay pipe with the bell ends facing in the direction of laying, unless otherwise shown on the Drawings, or directed by the ENGINEER. Exercise care to ensure that each length abuts against the next in such manner that no shoulder or unevenness of any kind occurs in the pipe line.

F. No wedging or blocking is permitted in laying pipe unless by written order of ENGINEER.

G. Before joints are made, bed each section of pipe the full length of the barrel with recesses excavated so pipe invert forms continuous grade with invert of pipe previously laid. Do not bring succeeding pipe into position until the preceding length is embedded and securely in place.

H. Dig bell holes sufficiently large to permit proper joint making and to ensure pipe is firmly bedded full length of its barrel.

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I. During “pushing home” of any style piping, timber shall be placed between the jacking device (backhoe, bucket, pipe jacket, etc.) and the pipe being driven home.

J. Walking or working on completed pipeline, except as necessary in tamping and backfilling, is not permitted until trench is backfilled one-foot deep over top of pipes.

K. Take up and relay pipe that is out of alignment or grade, or pipe having disturbed joints after laying.

L. Take up and replace with new, such in-place pipe sections found to be defective. Replacement work at CONTRACTOR's expense.

M. Take necessary precautions to prevent the floating of the pipeline by the accumulation of water in the trench, or the collapse of the pipeline from any cause. Should floating or collapse occur, restoration will be at the CONTRACTOR's expense.

N. Bedding and backfilling materials for buried pipe shall be as specified previously in Division 2, as specified in subsequent paragraphs, and in accordance with the Contract Drawings.

O. Take every precaution to prevent foreign material from entering the pipe while it is being placed. During laying operations, do not place debris, tools, clothing, or other materials in the pipe.

P. Close all openings in the pipeline with watertight plugs when pipe laying is stopped at the close of the day's work or for other reasons, such as rest breaks or meal periods.

Q. Place enough backfill over the center sections of the pipe to prevent floating.

R. Carry out the cutting of pipe only with equipment specifically designed for that purpose such as an abrasive wheel, rotary wheel cutter, a guillotine pipe saw or a milling wheel saw. The use of chisels will not be permitted. Cut ends and rough edges should be ground smooth and for push-on connections, the cut end should be beveled slightly.

S. In distributing material at the project site, each piece shall be unloaded opposite or near the place where it is to be laid in the trench. Each length of pipe shall be adequately blocked to prevent movement. Stockpiled pipe shall be adequately blocked to prevent movement. No pipe, material, or any other object shall be placed on private property, obstruct walkways or driveways, or in any manner interfere with the normal flow of traffic.

T. In the case of ductile iron pipe, special care shall be exercised, during handling temporary storage or construction to avoid damage to the bells, spigots or flanged ends. If damaged pipe cannot be repaired to the ENGINEER's satisfaction, it shall be replaced at the CONTRACTOR 's expense.

U. The CONTRACTOR shall be responsible for maintaining the minimum required

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distance between the water main and other utility lines in strict accordance with all Federal, State and local requirements and all right-of-way limitations.

V. The maximum allowable deflection at the joints for push-on joint pipe, regardless of pipe material shall be no more than 75 percent of the manufacturer's published recommendation.

W. In case the curve is too sharp for the allowable deflection, short lengths of pipe may be used upon approval of the ENGINEER and at no additional cost to the OWNER.

X. Care shall be exercised such that no high points are established where air can accumulate in the pipelines.

3.02 CONSTRUCTION METHODS TO AVOID CONTAMINATION

A. Heavy particulates generally contain bacteria and prevent even very high chlorine concentrations from contacting and killing such organisms. It is essential that the procedures of this section be observed to assure that a water main and its appurtenances are thoroughly clean for the final disinfection by chlorination.

B. Precautions shall be taken to protect the interiors of pipes, fittings, and valves against contamination. Pipe delivered for construction shall be strung to minimize entrance of foreign material. All openings in the pipeline shall be closed with watertight plugs when pipe laying is stopped at the close of the day's work or for other reasons, such as rest breaks or meal periods. Rodent-proof plugs may be used where it is determined that watertight plugs are not practical and where thorough cleaning will be performed.

C. Delay in placement of delivered pipe invites contamination. The more closely the rate of delivery is correlated to the rate of pipe laying, the less likelihood of contamination.

D. Joints of all pipe in the trench shall be completed before work is stopped. If water accumulates in the trench, the plugs shall remain in place until the trench is dry.

E. Yarning or packing material shall consist of molded or tubular rubber rings, or rope of treated paper or other approved materials. Materials such as jute, asbestos or hemp shall not be used. Packing material shall be handled in a manner that avoids contamination.

F. No contaminated material or any material capable of supporting prolific growth of microorganisms shall be used for sealing joints. Sealing material or gaskets shall be handled in a manner that avoids contamination. The lubricant used in the installation of sealing gaskets shall be suitable for use in potable water. It shall be delivered to the job in closed containers and shall be kept clean.

G. If dirt enters the pipe, and in the opinion of the ENGINEER the dirt will not be removed by the flushing operation, the interior of the pipe shall be cleaned by mechanical means and then shall be swabbed with a 1 percent hypochlorite disinfecting solution. Cleaning with the use of a pig, swab or "go-devil" should be

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undertaken only when the ENGINEER has specified such and has determined that such operation will not force mud or debris into pipe joint spaces.

3.03 DUCTILE IRON PIPE INSTALLATION

A. The installation of buried iron piping, except as otherwise shown or specified, shall conform to AWWA C-600, “Standard for Installation of Ductile Iron Water Mains and Appurtenances”. Boltless restrained joint pipe shall also be installed in accordance with manufacturer's recommended instructions.

B. Assembly of push-on pipe and mechanical joints valves shall be in accordance with the manufacturer's printed instructions and AWWA C-600. Installation of retainer glands shall be in accordance with the manufacturer's printed instructions. Torque wrenches shall be used for installation of mechanical and retainer glands.

C. The bell, plain end, and gasket shall be thoroughly cleaned and lubricated immediately before assembling the joint. The gasket shall then be inserted into the groove in the bell. Before starting joint assembly, a liberal coating of special lubricant shall be applied to the gasket and spigot end. With the spigot end centered in the bell, the spigot end is pushed home. Bolts for mechanical joints shall be tightened in an alternating top-to-bottom and side-to-side sequence to bring the gland up to the bell face evenly. If effective sealing is not achieved at the maximum torques listed AWWA C-600, the joint shall be disassembled, thoroughly cleaned, and reassembled. Over stressing of bolts to compensate for poor joint assembly will not be permitted.

D. All flanges, unless otherwise required, shall have standard drillings. Flanges shall be firmly bolted with machine, stud, or bolts of the proper size bar steel, with good, true threads, and shall be so tightened as to evenly distribute the stress in the bolts and bring the pipe into uniform alignment.

E. In general, no flanges shall be permitted underground except as directed by the ENGINEER, or as indicated on the Drawings.

F. Where required, flanges shall be tapped for stud bolts.

3.04 PRESSURE TESTS

A. All piping shall be tested as per Paragraph 1.4.2.5 of the SJCUD Standard Specifications, latest version.
   1. The test pressures for process piping shall be as follows:
      a. 50 percent above the normal operating pressure with a minimum of 150 psi.

3.05 BACTERIOLOGICAL TESTING

A. If pipe or fittings are intended for use or comes into contact with potable water, the requirements of this section shall be met.

B. After final flushing and before the piping is placed in service, samples will be collected by the OWNER and tested by the OWNER for bacteriological quality in

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accordance with Standard Methods for the Examination of Water and Wastewater.

C. Bacteriological tests must show complete absence of coliforms. If tests show presence of coliform CONTRACTOR will be required to perform additional flushing and disinfection of the pipeline until such time acceptable tests are obtained, all at no cost to the OWNER.

3.06 DISINFECTION

A. If pipe or fittings are intended for use or comes into contact with potable water, the requirements of this section shall be met.

B. Upon completion of installation, the interior of all piping shall be thoroughly cleaned and flushed.

C. After cleaning and flushing, and following pressure testing, all lines carrying water shall be disinfected in accordance with AWWA (C651) American Water Works Association Standard for Disinfection of Water Mains. Following chlorination and after the entire length is ready for service, all treated water shall be flushed thoroughly from the pipeline. The CONTRACTOR shall coordinate with the OWNER to take sample at the beginning and end of the new system and which will provide chemical and bacteriological tests on the samples. The tests shall prove that the entire piping system is free of pathogenic organisms.

D. Should the initial treatment prove ineffective, the disinfection procedure shall be repeated until satisfactory results are obtained.

3.07 DISPOSAL OF HEAVILY CHLORINATED WATER

A. After the applicable retention period, heavily chlorinated water should not remain in contact with the pipe for more than 48 hours. To prevent damage to the pipe lining or corrosion damage to the pipe itself, the heavily chlorinated water shall be flushed from the main until chlorine measurements show that the concentration in the water leaving the main is no higher than that generally prevailing in the distribution system, or is acceptable for domestic use.

B. The chlorine residual of water being disposed shall be neutralized by treating with one of the chemicals listed in Table 1. The proposed disposal site to which chlorinated water is to be discharged shall be approved by the OWNER. A reducing agent shall be applied to the chlorinated water to be wasted to completely neutralize the chlorine residual remaining in the water. Where necessary, federal, state and local regulatory agencies should be contacted to determine special provisions for the disposal of heavily chlorinated water.

C. The amount of chemicals (in pounds) required to neutralize various residual chlorine concentrations in 100,000 gallons of water are as follows:

Table 1

Residual Chlorine Concentration (mg/L)	Sulfur Dioxide	Sodium Bisulfite	Sodium Sulfite	Sodium Thiosulfate

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1	0.8	1.2	1.4	1.2
2	1.7	2.5	2.9	2.4
10	8.3	12.5	14.6	12.0
50	41.7	62.6	73.0	60.0

3.08 LOCATE WIRE TESTING

A. Locate wire shall be brought to grade within a valve box or locating station box at 200 foot intervals or less. Locate wire shall be installed in a box along the pipeline in either the 5:00 o'clock or 8:00 o'clock position relative to the pipe. Connection or splices underground which are not inside a locate box or valve box is not allowed.

B. Testing shall be performed by a person or company that has been certified by the manufacturer of the approved testing equipment as proficient in the use of the equipment. The certified tester shall be approved by SJCUD and the ENGINEER. An SJCUD representative may elect to be present during the testing period.

C. The CONTRACTOR shall provide the tester with a copy of the yard piping plan that has been marked up by the CONTRACTOR to identify pipes where locate wiring has been installed. The tester shall trace the entire length of pipe and mark any piping location variations from the marked-up plans. The depth to top of pipe shall be recorded at 50 foot intervals.

D. A final locate wire report shall be submitted to SJCUD and the ENGINEER for review and approval. The report shall include a signed and sealed statement from the tester that certifies all installed wire was successfully sounded and traced with no open breaks. The report shall include all field notes, breaks found/repaired, depths, and other applicable field remarks by the tester. The report shall be furnished prior to substantial completion of the project.

END OF SECTION 15072

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SPECIFICATION 15076

EQUIPMENT IDENTIFICATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Furnish and install all components of the system for identification of piping and equipment. The system includes the placing of identification signs and direction-of-flow arrows on all visible plant piping, the placing of nameplates on plant equipment and structures, and painting in color of all equipment and pipe, except stainless steel or aluminum surfaces, as shown on the Contractor's working drawings submitted under the related Specifications sections for equipment, piping and valves, and as required for a complete job.

1.02 RELATED SPECIFICATION

A. Specification 09900 - Painting

1.03 PAYMENT

A. No direct payment will be made for these signs, flow charts or appurtenances; the cost must be included in the price bid for the piping system as specified in the Specifications.

1.04 REFERENCES

A. ASTM D523 - Standard Test Method for Specular Gloss

B. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents

C. ASTM D638 - Standard Test Method for Tensile Properties of Plastics

D. ASTM D646 - Standard Test Method for Grammage of Paper and Paperboard (Mass per Unit Area)

E. ASTM D709 - Standard Specification for Laminated Thermosetting Materials

F. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

G. ASTM D792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement

H. ASTM D5420 - Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact)

1.05 MANUFACTURER'S GUARANTEE

A. Provide the specified items from firms regularly engaged in the manufacture of identification devices of types and sizes required, with at least five (5) years' experience in manufacturing signs. In addition, the manufacturer shall guarantee the sign, in writing, against color fading, chipping, corroding or any other manufacturing defects for a period of ten (10) years.

1.06 SPARE PARTS AND ACCESSORIES

A. Furnish the following spare parts and accessories:

1. One complete nameplate mounting assembly for every 20 nameplates installed

B. Provide all spare parts and accessories suitably boxed and marked for storage and reordering.

PART 2 PRODUCTS

2.01 MATERIALS

A. Construct fiberglass reinforced plastic identification signs and nameplates of 70 mils thick fiberglass reinforced plastic conforming to ASTM D709.

B. Provide fiberglass reinforced plastic process with a blemish free, low gloss surface of superior permanence and durability in the colors selected. Provide each identification sign and nameplate in two colors and with the legend specified. Provide the backside of the sign in black or some other uniform color.

C. Provide lettering made by silk screening or other permanent embedment of subsurface printed graphics in the material so as to produce a clear, legible sign. Do not place lettering, symbols or markings containing the name of the manufacturer on the signs. The contract number and the year of the contract as given on the Contract Drawings may be placed in small lettering on the front of the sign, if approved by the Engineer.

D. Provide nameplates for equipment and structures with four 3/8 inch diameter grommet-protected holes, the center of the hole located ½ inch away from the edges. Provide all holes with suitable brass or stainless steel grommets.

E. Construct all signs and nameplates in conformity with ASTM D523, D638, D646, D790, D792 and D5420.

2.02 DIMENSIONS OF SIGNS AND TAGS

A. Provide identification signs and nameplates rectangular in shape and of the dimensions specified below. A dimensioned tolerance of plus or minus 1/16 inch is permissible.

TYPE OF SIGN	Sign Dimensions (Width x Length)
PIPE IDENTIFICATION -	
1. Outside diameter of pipe (including pipe insulation):	
a. 4 inches and larger	3-1/2 x 12 inches
b. less than 4 inches	1-1/2 x 7 inches
NAMEPLATES -	
1. Equipment and structures	3-1/2 x 12 inches

2.03 LETTERING OF SIGNS

A. Perform all lettering and numbering on identification signs and nameplates in block style in size and spacing to suit the size of sign, as approved by the Engineer.

B. Unless otherwise approved, limit the legend on pipe identification signs to one line and to a total of 12 letters and spaces, and the legend on equipment nameplates to two lines and a maximum of 35 letters and spaces.

C. Submit samples of the lettering to be used for fiberglass reinforced plastic signs to the Engineer for approval before manufacturing begins. Such samples must show the height, width and spacing of letters and numbers for any three (3) legends of ten or more letters and spaces as listed in Article 2.06.

2.04 CHEMICAL RESISTANCE

A. Provide fiberglass reinforced plastic signs resistant to abrasion, impact, corrosion, and the following acids, alkalis, salts and solvents in accordance with ASTM D543:

1. 10% citric acid

2. 5% acetic acid

3. 3-30% sulfuric acid

4. 10% ammonium hydroxide

5. 10% sodium chloride

6. turpentine

7. mineral spirits
8. heptane
9. kerosene
10. ethyl alcohol
11. ethyl acetate
12. transformer oil
13. heavy duty detergents
14. water

B. Submit certification on acid resistance to the Engineer prior to installation.

2.05 COLORS

A. Code equipment nameplates and finish coats of paint for equipment in basic colors.

B. Provide brilliant colors, distinctive shades matching as closely as possible (without custom color blending) the following basic colors as specified by the Munsell Color System (MN):

Table Of Standard Colors	
Color	**Munsell Number**
White	MN - N8.8/
Yellow	MN - 4Y7.5/12.8
Orange	MN - 0.5 YR 4.6/12.2
Red	MN - 7R 3.6/12.7
Brown	MN - 2.5 YR 4.2/4.3
Gray	MN - 2.5PB 5.8/1.7
*Charcoal	MN - 6B 5/0.4
Black	MN - N1/
Blue	MN - 3PB 3.3/7.4

Table Of Standard Colors	
Color	**Munsell Number**
Green	MN - 8G 4.4/6.2
* Provide color "Charcoal" for paints equivalent to MN - N 3.75.	

C. Provide identification signs for pipelines of all sizes, mechanical equipment in the color combinations specified below under "General Color Code".

General Color Code		
Service Line	**Colors**	
	Letters	**Background**
1. HEATING, VENTILATING AND CONDITIONING AIR (Equipment And Ductwork)	Green	Charcoal

2.06 LEGEND FOR PIPE IDENTIFICATION SIGNS

A. Provide identification signs with the following words or abbreviations in color combinations shown to identify the pipe line service:

Pipe Identification Signs			
LEGEND	**Service**	**Color Code**	
		Lettering	**Background**
CONDENSATE	Condensate	Yellow	Blue
REFRIGERANT	Refrigerant	Black	Yellow
DRAIN -*	Drain-*	*	*
* Where shown, specified or required, the legend for blowoff, drain, metering, sump, vent and similar lines shall also include the equipment, structure or identification number to which the service applies.			

B. Number valves in conformity with the Basic Code as specified by the Operation and Maintenance Manual for the plant; see Article 2.07. Perform color combinations for such lines and valves in the same color combinations as the medium serviced and as given in the "General Color Code" of Article 2.05.

C. In addition to the identification requirements listed above, for all gas piping at pressures above ½ psig, show the maximum pressure level within the piping.

2.07 ARROWS

A. Make direction-of-flow arrows for attachment to pipe identification signs from No. 16 U.S. gauge Type 316 stainless steel, the full width of the sign. Make the arrow head with a tapered point, about 90 degrees at the apex, extending one half of the sign width from the sign edge and one half of the sign width extending under the sign. Finish all edges of the arrow. Make point with a radius of 1/4 inch for the 3-1/2 inch wide sign and a radius of 3/16 inch for the 1-1/2 inch wide sign. Punch detents on the arrows to prevent twisting of the point. Drill one hole in the arrow in alignment with the hole in the pipe identification sign so that both sign and arrow can be mounted with the same screw and bracket.

B. Submit sample direction-of-flow arrows for both sizes of pipe identification signs to the Engineer for approval before installation.

2.08 NAMEPLATES

A. Provide nameplates for equipment and structures in the same color combination as the medium they service. Legends for nameplates must follow the terminology shown. Provide numbering system as described in the Operation and Maintenance Manual.

B. The following is a representative list, not necessarily complete, of nameplate legends with appropriate color combinations to which the equipment identification number must be added:

N A M E P L A T E S			
Legend		**Color Code**	
First Line (1)	**Second Line (2)**	**Lettering**	**Background**
EXHAUST FAN	**	White	Charcoal
VARIABLE REFRIGERANT FLOW (VRF) UNITS (INDOOR/OUTDOOR)	UNIT**	White	Charcoal

N A M E P L A T E S			
Legend		**Color Code**	
First Line (1)	**Second Line (2)**	**Lettering**	**Background**
SPLIT SYSTEM HEAT PUMP (INDOOR/OUTDOOR UNITS)	UNIT**	White	Charcoal

(1) Nominal limit of 18 letters, numerals and spaces.
(2) Nominal limit of 17 letters, numerals and spaces.

*Where equipment is mounted on roofs or where exposed to the public view, such as in lobby or office areas, the color will be selected by the Architect.

**The legend on these nameplates also includes the appropriate six-digit numeral and letter designation for such equipment and structures as specified by the Operation and Maintenance Manual.

**** The legend on these nameplates also includes the appropriate tag number as specified by the Operation and Maintenance Manual.**

2.09 ADDITIONAL SIGNS AND NAMEPLATES

A. In addition to the legends specified above, the Engineer may order the Contractor to furnish and install additional identification signs, arrows and nameplates at no additional cost to the owner. Such additional signs may be requested near completion of the work and will be limited to no more than five (5) signs for each of the five types specified in Article 2.02. Conform legends and color combinations for additional signs to the requirements specified.

2.10

2.10 DUCTWORK

A. All ductwork shall be identified by plastic markers not less than 4 inches high in a color in contrast to the surface on which it is mounted. The markers shall be fastened to the ductwork with sheet metal screws or machine screws and hex nuts. Markers shall indicate system title function. Duct markers shall indicate area served, function, i.e., supply, return or exhaust and direction of flow.

B. Duct markers shall be located not more than 50 feet apart on all mains and branches. Markers shall be placed on ducts on each side of the wall or floor through which they pass. Markers shall also be placed adjacent to access panels. All markers shall be so located as to be clearly visible to a person standing on the floor.

PART 3 EXECUTION

3.01 LOCATION

A. Locate nameplates on equipment bases and on structures at readily visible levels in such positions relative to the equipment and structures so as to prevent damage to the nameplate.

3.02 MOUNTING

A. Provide mounting assembly "Steelbinder" strapping unit as manufactured by A.J. Gerrard & Co., Des Plaines, Illinois, Independent Metal Strap Co., Inc., Roslyn, N.Y. or approved equal.

B. Mount nameplates in a manner specifically approved by the Engineer after the installation of equipment or construction of structures. Submit details of the method of fastening to the Engineer for approval. Provide fastening devices for nameplates and valves of stainless steel construction.

END OF SECTION 15076

SECTION 15076

PIPING AND EQUIPMENT IDENTIFICATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Furnish and install all components of the system for identification of piping and equipment. The system includes the placing of identification signs and direction-of-flow arrows on all visible plant piping, the placing of nameplates on plant equipment and structures, and painting in color of all equipment and pipe, except stainless steel or aluminium surfaces, as shown on the CONTRACTOR's working drawings submitted under the related Specifications sections for equipment, piping and valves, and as required for a complete job.

1.02 RELATED SPECIFICATION

A. Specification 09900 - Painting

1.03 REFERENCES

A. ASTM D523 - Standard Test Method for Specular Gloss

B. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents

C. ASTM D638 - Standard Test Method for Tensile Properties of Plastics

D. ASTM D646 - Standard Test Method for Grammage of Paper and Paperboard (Mass per Unit Area)

E. ASTM D709 - Standard Specification for Laminated Thermosetting Materials

F. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

G. ASTM D792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement

H. ASTM D5420 - Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact)

1.04 MANUFACTURER'S GUARANTEE

A. Provide the specified items from firms regularly engaged in the manufacture of identification devices of types and sizes required, with at least five (5) years' experience in manufacturing signs. In addition, the manufacturer shall guarantee the sign, in writing, against color fading, chipping, corroding or any other manufacturing defects for a period of ten (10) years.

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1.05 SPARE PARTS AND ACCESSORIES

A. Furnish the following spare parts and accessories:
   1. For every 20 pipe identification signs installed:
      a. One pair stainless steel mounting screws
      b. One pair stainless steel threaded brackets
      c. One pair fiber or plastic washers
      d. One pair stainless steel banding seals
   2. One set banding tools and banding accessories
   3. One stainless steel banding strap, approximately 1000 ft.
   4. One complete nameplate mounting assembly for every 20 nameplates installed
   5. One stainless steel cable and splice for every 20 valve identification tags

B. Provide all spare parts and accessories suitably boxed and marked for storage and reordering.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Construct fiberglass reinforced plastic identification signs and nameplates of 70 mils thick fiberglass reinforced plastic conforming to ASTM D709.

B. Provide fiberglass reinforced plastic process with a blemish free, low gloss surface of superior permanence and durability in the colors selected. Provide each identification sign and nameplate in two colors and with the legend specified. Provide the backside of the sign in black or some other uniform color.

C. Provide lettering made by silk screening or other permanent embedment of subsurface printed graphics in the material so as to produce a clear, legible sign. Do not place lettering, symbols or markings containing the name of the manufacturer on the signs. The contract number and the year of the contract as given on the Contract Drawings may be placed in small lettering on the front of the sign, if approved by the ENGINEER.

D. Provide signs for piping and valve identification with two 3/8 inch diameter grommet-protected holes located on the long side center line, the center of the hole to be ½ inch from the edge. Provide nameplates for equipment and structures with four 3/8 inch diameter grommet-protected holes, the center of the hole located ½ inch away from the edges. Provide all holes with suitable brass or stainless steel grommets.

E. Construct all signs and nameplates in conformity with ASTM D523, D638, D646, D790, D792 and D5420.

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2.02 DIMENSIONS OF SIGNS AND TAGS

A. Provide identification signs and nameplates rectangular in shape and of the dimensions specified below. A dimensioned tolerance of plus or minus 1/16 inch is permissible.

TYPE OF SIGN	Sign Dimensions (Width x Length)
Pipe Identification -	
1. Outside diameter of pipe (including pipe insulation):	
a. 4 inches and larger	3-1/2 x 12 inches
b. less than 4 inches	1-1/2 x 7 inches
Valve Identification -	
1. Valve tags	2 inches diameter
2. Operating stands for valves and sluice gates	1-1/2 x 7 inches
Nameplates -	
1. Equipment and structures	3-1/2 x 12 inches

2.03 LETTERING OF SIGNS

A. Perform all lettering and numbering on identification signs and nameplates in block style in size and spacing to suit the size of sign, as approved by the ENGINEER.

B. Unless otherwise approved, limit the legend on pipe identification signs to one line and to a total of 12 letters and spaces, and the legend on equipment nameplates to two lines and a maximum of 35 letters and spaces.

C. Submit samples of the lettering to be used for fiberglass reinforced plastic signs to the ENGINEER for approval before manufacturing begins. Such samples must show the height, width and spacing of letters and numbers for any three (3) legends of ten or more letters and spaces as listed in Paragraph 2.05.

2.04 COLORS

A. Code pipeline signs and equipment nameplates and finish coats of paint for pipe lines and equipment in basic colors.

B. Provide brilliant colors, distinctive shades matching as closely as possible (without custom color blending) the following basic colors as specified by the Munsell Color System (MN):

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Table of Standard Colors	
Color	Munsell Number
White	MN - N8.8/
Yellow	MN - 4Y7.5/12.8
Orange	MN - 0.5 YR 4.6/12.2
Red	MN - 7R 3.6/12.7
Brown	MN - 2.5 YR 4.2/4.3
Gray	MN - 2.5PB 5.8/1.7
*Charcoal	MN - 6B 5/0.4
Black	MN - N1/
Blue	MN - 3PB 3.3/7.4
Green	MN - 8G 4.4/6.2
* Provide color "Charcoal" for paints equivalent to MN - N 3.75.	

C. Provide identification signs for pipelines of all sizes, mechanical equipment, slide gates and valves in the color combinations specified below under "General Color Code".

General Color Code		
	Colors	
Service Line	**Letters**	**Background**
1. Refrigerant Pipe	White	Blue
2. Heating, Ventilating, and Conditioning Air (Equipment And Ductwork)	Green	Charcoal

D. Provide vents and drains of the same color combination as the contents of tanks and equipment vented and drained.

2.05 LEGEND FOR PIPE IDENTIFICATION SIGNS

A. Provide identification signs with the following words or abbreviations in color combinations shown to identify the pipe line service:

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Pipe Identification Signs			
		Color Code	
Legend	Service	Lettering	Background
CONDENSER	Condensate	Yellow	Blue
AIR CONDITIONING	Unit	White	Charcoal
REFRIGERANT	Refrigerant piping	White	Blue
WATER	City water	Blue	Orange
RO PERMEATE WATER	Finished water	White	Green
RO CONCENTRATE WATER	Waste water	Black	Yellow
BYPASS WATER	Untreated water	White	Blue
ANTISCALANT	Chemical Piping	Black	Orange
* Where shown, specified or required, the legend for blowoff, drain, metering, sump, vent and similar lines shall also include the equipment, structure or identification number to which the service applies.			

B. In addition to the identification requirements listed above, for all gas piping at pressures above ½ psig, show the maximum pressure level within the piping.

2.06 VALVE IDENTIFICATION TAGS

A. Furnish and attach valve identification tags on all valves and controls.

B. Provide round fiberglass reinforced plastic discs tags, approximately 2 inches in diameter, made in conformity with the requirements of Article 2.01. Provide tags with one 1/8-inch grommet protected hole at the top for fastening to the valve body using 1/16-inch diameter cable and splices or pins as approved. Provide grommets, cable splices and pins of stainless steel or other approved corrosion resistant material.

C. Provide numbering code for the identification tags in conformity with the Basic Code as specified by the Operation and Maintenance Manual for the plant. Assign identification numbers subject to the approval of the ENGINEER and in conformity with the entire piping and equipment identification system. Provide identification code for each valve and control without duplication. Provide lettering on identification tags not less than 5/16-inch high and limited to two lines. Silk-screen lettering in correct color combination; stenciled or painted numbers and lettering will not be accepted.

D. In addition to the tagging requirements listed above, provide tags at all gas valves at pressures above ½ psig with the operating pressure within the valve shown.

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2.07 ARROWS

A. Make direction-of-flow arrows for attachment to pipe identification signs from No. 16 U.S. gauge Type 304 stainless steel, the full width of the sign. Make the arrow head with a tapered point, about 90 degrees at the apex, extending one half of the sign width from the sign edge and one half of the sign width extending under the sign. Finish all edges of the arrow. Make point with a radius of 1/4 inch for the 3-1/2-inch wide sign and a radius of 3/16 inch for the 1-1/2-inch wide sign. Punch detents on the arrows to prevent twisting of the point. Drill one hole in the arrow in alignment with the hole in the pipe identification sign so that both sign and arrow can be mounted with the same screw and bracket.

B. Submit sample direction-of-flow arrows for both sizes of pipe identification signs to the ENGINEER for approval before installation.

2.08 NAMEPLATES

A. Provide nameplates for equipment and structures in the same color combination as the medium they service. Legends for nameplates must follow the terminology shown. Provide numbering system as described in the Operation and Maintenance Manual.

B. The following is a representative list, not necessarily complete, of nameplate legends with appropriate color combinations to which the equipment identification number must be added:

Nameplates			
Legend		Color Code	
First line (1)	Second line (2)	Lettering	Background
HEAT PUMP	UNIT **	White	Charcoal
CONDENSER	AIR COOLED **	Yellow*	Blue*

(1) Nominal limit of 18 letters, numerals and spaces.
(2) Nominal limit of 17 letters, numerals and spaces.
*Where equipment is mounted on roofs or where exposed to the public view, such as in lobby or office areas, the color will be selected by the Architect.
**The legend on these nameplates also includes the appropriate six-digit numeral and letter designation for such equipment and structures as specified by the Operation and Maintenance Manual.
** The legend on these nameplates also includes the appropriate tag number as specified by the Operation and Maintenance Manual.

2.09 ADDITIONAL SIGNS AND NAMEPLATES

A. In addition to the legends specified above, the ENGINEER may order the CONTRACTOR to furnish and install additional identification signs, arrows and nameplates at no additional cost to the owner. Such additional signs may be

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requested near completion of the work and will be limited to no more than five (5) signs for each of the five types specified in paragraph 2.02. Conform legends and color combinations for additional signs to the requirements specified.

2.10 COLOR OF PIPELINES

A. Paint all pipelines and equipment in conformity with the requirements of Specification 09900- Painting. Color code the color of the final coats of paint.

B. Match the color of the final coats as closely as possible, without custom blending, to the colors presented in the following table. The colors in this table are identified by their Federal Standard 595B Colors identification number and shall match this standard. The names of the colors in this table are for convenience only.

C. Do not paint aluminum or stainless steel ductwork or jackets on insulated pipelines. Should the specifications state that flanges, flexible couplings, valves and fittings for such jacketed lines not be covered, paint only the flanges, flexible couplings, valves and fittings in accordance with the piping color code.

Pipeline Identification		
ABBR.	Process/Service Line	Fed. Std. 595B Color
C	Condensate	Gray 16357

D. Do not paint stainless steel, and interior PVC and CPVC pipes. Provide banding for unpainted piping. The color of the bands should be in accordance with the following table. The color band width shall be 6-inches. The color band spacing shall be at 6-foot intervals. In situations where two colors do not have sufficient contrast to easily differentiate between them, a six-inch band of contrasting color shall be provided on one of the pipes at approximately 30-inch intervals.

PART 3 - EXECUTION

3.01 LOCATION

A. Locate identification signs for piping along straight line runs at intervals of not more than 30 feet, near valves, branches and junction points and where pipes pass through walls or ceilings. Place direction-of-flow arrows as shown or required. Locate signs on large valves on or adjacent to the valve itself. Place all piping identification signs so as to be easily visible from operating locations. Locate nameplates on equipment bases and on structures at readily visible levels in such positions relative to the equipment and structures so as to prevent damage to the nameplate.

3.02 MOUNTING

A. Mount identification signs and arrows on piping parallel and tangent to the pipe and valves by fastening with screws, plastic or fiber washers, threaded brackets and banding straps and seals. Provide screws and brackets of stainless steel with

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5/16 - 18 American Standard Coarse Threads; provide No. 25 U.S. gauge stainless steel, ¾-inch wide bands.

B. Where pipe is insulated, use care in mounting the signs so to prevent the banding straps from crushing the insulation.

C. Provide mounting assembly "Steelbinder" strapping unit as manufactured by A.J. Gerrard & Co., Des Plaines, Illinois, Independent Metal Strap Co., Inc., Roslyn, N.Y. or approved equal.

D. Mount nameplates in a manner specifically approved by the ENGINEER after the installation of equipment or construction of structures. Submit details of the method of fastening to the ENGINEER for approval. Provide fastening devices for nameplates and valves of stainless steel construction.

E. Mount valve identification signs with approved stainless steel brackets or approved stainless steel strapping in such a fashion that sharp corners or edges on signs, brackets, bolts, chain or strapping will not constitute a hazard to personnel operating the valves. Since it is impractical to detail each means of attachment in the Specifications or on the Contract Drawings, each means of attachment will receive approval only on its own merits. Submit for approval sketches of each type proposed.

F. Do not attach identification tags or signs to handwheels. Use of flange bolts or bonnet bolts as a means of attachment of brackets will receive consideration. Provide all attachment devices and bolting of Type 304 stainless steel.

END OF SECTION 15076

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SECTION 15081

PIPING INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section includes insulation and jacketing requirements for typical piping systems, including piping, valves and accessories. The CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified or required to furnish and install the piping insulation work.

1.02 RELATED SPECIFICATIONS

A. Specification 09900 - Painting

B. Specification 15060 - Hangers and Supports - HVAC

1.03 REFERENCES

A. ASTM C 195 - Standard Specification for Mineral Fiber Thermal Insulating Cement

B. ASTM C 240 - Standard Test Methods of Testing Cellular Glass Insulation Block

C. ASTM C 411 - Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation

D. ASTM C 534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form

E. ASTM C 552 - Standard Specification for Cellular Glass Thermal Insulation

F. ASTM C 547 - Standard Specification for Mineral Fiber Pipe Insulation

G. ASTM C 1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.

H. ASTM D 1056 - Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber

I. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials

J. ASTM E 96 - Standard Test Method for Water Vapor Transmission of Materials

K. International Building Code

L. International Energy Conservation Code

M. NFPA 255 - Surface Burning Characteristics of Building Materials

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1.04 SUBMITTALS

A. General: The CONTRACTOR shall provide all submittals in accordance with Section 01300.

B. Product Data:
   1. Insulation and related materials: Submit the manufacturer's technical product data, insulation materials, densities, fire ratings, flame-spread ratings, smoke-developed ratings, fuel contributed ratings, material safety data sheets and installation instructions for each type of piping insulation and related materials. Submit a schedule showing the manufacturer's product number, K-value, thickness, and furnished accessories for each piping system requiring insulation.
   2. Stainless steel jacketing: Submit the manufacturer's technical data for jacketing and related materials.

C. Installation Drawings: Complete assembly, layout and installation drawings with clearly marked dimensions.

1.05 QUALITY ASSURANCE AND QUALIFICATIONS

A. Manufacturer's Qualifications: Provide insulation from firms regularly engaged in manufacture of piping insulation products, of the types and sizes required, whose products have been in satisfactory use in similar services for not less than 3 years.

B. Installer's Qualifications: Use a single firm with at least 5 years successful installation experience on projects with insulations similar to that required for this project.

1.06 DELIVERY, STORAGE AND HANDLING

A. General: Deliver, store and handle all products and materials as specified in Section 01600.

B. Labeling: Deliver the insulation, coverings, cements, adhesives, and coatings to the site in containers with the manufacturer's stamp or label, affixed showing the fire hazard indexes of products.

C. Protection: Protect the insulation against dirt, water, and chemical and mechanical damage. Do not install damaged or wet insulation. Remove damaged materials from the project site.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. General: Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.

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B. Style A Insulation
   1. Johns Manville Corp.
   2. Owens-Corning Fiberglass Corp.

C. Style B Insulation
   1. Armstrong World Industries, Inc.
   2. Rubatex Corp.

D. Style C Insulation
   1. Pittsburgh Corning Corp.

E. Stainless Steel Jacketing
   1. Childers Product Company, Lock-On

F. Thermal Hanger Shields
   1. Pipe Shields Inc

2.02 FLAME/SMOKE RATINGS

A. Piping insulation shall have a composite (insulation, jackets, coverings, sealers, mastics and adhesives) flame-spread index of 25 or less, fuel-contributed rating of 50 or less, and smoke-developed index of 50 or less, as tested by ASTM E 84 (NFPA 255) method. Any treatments of jackets or facings to impart flame and smoke safety shall be permanent. The use of water-soluble treatments shall be prohibited.

2.03 BUILDING CODE COMPLIANCE

A. Piping insulation products shall comply with the latest editions of the International Building Code and the International Energy Conservation Code.

2.04 MATERIALS

A. Style A Insulation - Molded Fiberglass Pipe Insulation
   1. Style A insulation shall be heavy-duty, bonded fibrous glass sectional pipe insulation with a thermal conductivity not exceeding 0.26 BTU per hour per square foot per degree F per inch thickness at 50 degrees F mean temperature and not exceeding 0.3 BTU per hour per square foot per degree F per inch thickness at 200 degrees F mean temperature. Insulation shall be provided with factory-applied vapor retarder. The vapor retarder shall be an ASJ (all-service jacket) type meeting the requirements of ASTM C 1136 Type 1 and consisting of laminated white kraft paper, reinforcing scrim and foil. The insulation shall meet the requirements of ASTM C 547, Type 1. Insulation shall be rated for use at temperatures up to 850 degrees F.
   2. Joints and Seams: Provide joints and seams meeting one of the following requirements
      a. Field cemented joints: All joints and seams shall be sealed with approved adhesive, and the joints covered with joint sealing tape at least 3 inches in width, permanently adhered.

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b. Sealing strips: All longitudinal joints shall be sealed with integral adhesive sealing strip, and butt joints shall be covered with 3-inch width of vapor barrier butt joint strip tape.

3. Fittings, flanges and valves: Provide insulation meeting one of the following requirements
   a. Fittings, flanges and valves shall be insulated with fiber glass molded or segmented insulation, and wrapped with joint sealing tape of matching color.
   b. Alternatively, fittings, flanges and valves may be insulated with factory cut glass blanket.

B. Style B Insulation - Flexible Elastomeric Cellular Insulation
1. Style B insulation shall be flexible elastomeric type, closed cell, cylindrical or sheet type as required by the application. Flexible elastomeric insulation shall have a thermal conductivity not exceeding 0.27 BTU per hour per square foot per degree F per inch thickness at 75 degrees F mean temperature. Water absorption shall be less than 5% (ASTM D 1056). Water vapor permeability shall not exceed 0.10 perms per inch in accordance with ASTM E 96 Procedure A. The insulation shall meet the requirements of ASTM C534 and ASTM D 1056.
2. Joints and Seams: All joints shall be cut straight and butted with no gaps. Seal all joints with the manufacturer's recommended adhesive.
3. Fittings, flanges and valves:
   a. Seams and mitered joints shall be adhered using the manufacturer's recommended adhesive. Screwed fittings shall be sleeved and adhered with a minimum one-inch overlap onto the adjacent insulation.
   b. Flanges, strainers, couplings and valves shall be insulated using donuts, then covered with sheet or oversize tubular insulation.
4. Coating
   a. Where insulation is installed outdoors, coatings shall be provided to protect the insulation from ultraviolet radiation. Coatings shall be as recommended by the insulation manufacturer and approved by the ENGINEER.

C. Style C Insulation - Cellular Glass
1. Cellular glass insulation shall have a water absorption not exceeding 0.2 percent (ASTM C 240), have 0.20 perms-inch water vapor permeability (ASTM E 96), service temperature range of at least 0 to 220 degrees F, a minimum density of 8.0 lbs per cubic foot, compressive strength of 100 psi, and maximum thermal conductivity of 0.32 BTU per hour per square foot per degree F per inch thickness at 75 degrees F average temperature. Where field-applied stainless steel jacketing is not required over the insulation, the insulation shall be provided with a factory-applied facing of aluminum foil laminated to glass fiber reinforced white vinyl facing. The insulation shall meet the requirements of ASTM C 552.

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2. Joints and Seams:
   a. Insulation joints shall be sealed with the insulation manufacturer's recommended vapor-resistant joint sealant.
   b. Factory-applied facing shall have its longitudinal seams sealed with vapor resistant adhesive and butt joints sh all be wrapped with 3 inch width joint sealing tape, all as recommended by the insulation manufacturer and approved by the ENGINEER.
3. Fittings, flanges and valves: Fittings, flanges and valves shall be insulated with preformed cellular glass insulation. Fitted insulation segments shall be used on sizes for which preformed shapes are not manufactured, of the same material and thickness and applied in the same manner as for pipe insulation.
4. Where indicated on the Contract Drawings or in the Specifications, the interior bore of the insulation shall be coated to prevent abrasion of the pipe. For pipe operating near ambient temperature, the coating shall be a gypsum cement molding plaster such as U. S. Gypsum Hydrocal B-11, or equal, as recommended by the insulation manufacturer.

D. Stainless Steel Jacketing
1. Stainless steel jacketing shall be constructed of Type 316 stainless steel, not less than 0.016 inch thick. It shall have a modified Pittsburgh Z-lock on the longitudinal seam. Jacketing shall be provided with an integrally bonded moisture barrier. Adjacent sections shall butt together and shall be secured with a weather-proof butt strap. Jacketing shall be secured with 3/4-inch wide, 0.015-inch thick stainless steel bands at a maximum spacing of twelve inches. All edges of strapping shall be factory de-burred. All insulated fittings shall be finished in the same manner, using 0.024-inch thick type 316 stainless steel preformed fitting covers and fabricated covers made from the same material for valves, flanges, tees, in-line accessories, and other pipeline appurtenances. Type 316 stainless steel end caps shall be provided at the ends of the pipelines.

E. Accessories
1. Provide staples, bands, wires and cement as recommended by the insulation manufacturer and approved by the ENGINEER for the applications indicated.
2. Provide adhesives, sealers, and protective finishes as recommended by the insulation manufacturer and approved by the ENGINEER for the applications indicated.

F. Thermal Hanger Shields
1. Provide insulated pipe protectors consisting of a 360-degree high density, 100 psi, waterproofed calcium silicate inserts encased in 360-degree sheet metal. On cold water pipes provide protectors with insulation extended 1-inch beyond the sheet metal shield.
2. Provide the thickness of the insulation insert to be the same as the adjoining pipe insulation, and sheet metal gauge in accordance with the manufacturer's recommendations.

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3. Provide metal components manufactured of Type 316 stainless steel. Pipe hangers and supports provided in conjunction with the thermal hanger shields shall meet the requirements of Specification 15060.

PART 3 - EXECUTION

3.01 INSPECTION

A. General: Examine areas and conditions under which piping insulation is to be installed. Do not proceed with Work until unsatisfactory conditions have been corrected in manner acceptable for insulation installation, as determined by the ENGINEER.

3.02 INSTALLATION

A. General: Install piping insulation products in accordance with the manufacturer's recommendations and approved shop drawings, and as specified in Division 1. Install piping insulation products in accordance with the latest edition of the International Building Code. Install all products in accordance with the recognized industry practices so that insulation serves its intended purpose. Insulated thermal hangers shields shall be installed at all support points, except where otherwise indicated.

B. Piping Insulation:
   1. Order of Installation: Install insulation on pipe systems subsequent to the installation of painting, testing, and acceptance tests. Piping shall be field tested and approved by the ENGINEER prior to installation of insulation.
   2. Cleaning and Drying: Pipe surfaces shall be cleaned and dried prior to insulating.
   3. Insulation Surfaces: Install the insulation materials with smooth, even and flush adjoining surfaces. Butt insulation joints firmly together to form a complete and tight fit over the surfaces to be covered. Insulate each continuous run of piping with full-length units of insulation, with a single cut piece to complete the run. Do not use cut pieces or scraps abutting each other.
   4. Vapor Barrier: Maintain integrity of the vapor-barrier jackets on pipe insulation, and protect to prevent puncture or other damage. Vapor barrier materials shall be applied to form a complete, unbroken vapor seal over the entire insulated piping system.
   5. Insulating Fittings: Cover valves, fittings and similar items in each piping system with an equivalent thickness and composition of insulation as applied to the adjoining pipe run. Install factory molded, precut or job fabricated units except where a specific form or type is indicated.
      a. Unless indicated otherwise, piping insulation shall be extended without interruption through interior walls, floors and similar piping penetrations. Annular spaces between pipe and pipe sleeves shall be thoroughly packed with fibrous glass blanket and caulked with mastic so as to be soundproof and vermin-tight. Provide fibrous glass blanket with properties equivalent to the insulation Style installed on the piping.

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b. Do not extend insulation through walls or floors that are fire rated or are required to be gas-tight.

6. Pipe Hangers:
   a. Butt pipe insulation against pipe hanger insulation inserts.
   b. For hot pipes, apply a 3 inch wide vapor barrier tape or band over the butt joints.
   c. For cold piping apply a wet coat of the vapor barrier lap cement on butt joints and seal the joints with a 3 inch wide vapor barrier tape or band. Pipe hangers and supports shall be installed outside of the vapor seal.
7. Removable Items: Install removable insulation sections on the following:
   a. Devices that require access for maintenance of equipment
   b. Items that can be removed, such as unions, screwed joints, flanges, strainers, etc.

C. Stainless Steel Jacketing: Provide stainless steel jacketing over all insulated piping systems. Install jacketing in accordance with the manufacturer's recommendations and approved shop drawings.

D. Pipe exposed to weather:
   1. Pipe hangers and supports shall be on the outside of the stainless steel jackets, and shall not penetrate the jacketing.
   2. Do not install thermal hanger shields on pipelines using cellular glass insulation. At each such location, a preformed Type 316 stainless steel insulation shield shall be provided. The insulation shield shall envelope at least the lower half of the insulated pipe and shall limit the compressive load on the insulation to 33 psi or less.

E. All jacket openings - such as at overlaps of jackets with thermal hanger shields, around valve stems and similar projections - shall be sealed with nonhardening, waterproof, clear or white sealing compound so that upon completion the insulation is essentially watertight.

3.03 PROTECTION AND REPLACEMENT

A. Protection: Insulation shall be protected against dirt, water, chemical or mechanical damage before, during and after installation. Follow methods which are required for protection of the insulation work during the remainder of construction period, to avoid damage and deterioration.

B. Replacement: Any insulation or covering damaged prior to final acceptance of the work shall be satisfactorily repaired or replaced, including units with vapor barrier damage and moisture saturated units.

3.04 PAINTING AND CLEANING

A. Piping insulation shall be painted in accordance with Specification 09900.

B. The CONTRACTOR shall remove all debris, waste materials and loose foreign matter resulting from installation.

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3.05 CONTRACT PIPING SYSTEM INSULATION THICKNESS SCHEDULE

A. General: The CONTRACTOR shall provide piping insulation on the following mechanical piping systems and as indicated in the Specifications.

B. Thickness: The CONTRACTOR shall provide the following minimum insulation thicknesses as shown in the table below.

Fluid Temperature Range	Insulation Conductivity		Nominal Pipe Size (inches)				
	Conductivity BTU x in. / (h x ft^2 x °F)	Mean Rating Temperature, °F	<1	1 to < 1-1/2	1-1/2 to < 4	4 to < 8	≥8
> 350	0.32 – 0.34	250	4.5	5.0	5.0	5.0	5.0
251 – 350	0.29 – 0.32	200	3.0	4.0	4.5	4.5	4.5
201 – 250	0.27 – 0.30	150	2.5	2.5	3.0	3.0	3.0
141 - 200	0.25 – 0.29	125	1.5	1.5	2.0	2.0	2.0
105 – 140	0.22 – 0.28	100	1.0	1.0	1.5	1.5	1.5
40 – 60	0.21 – 0.27	75	1.0	1.0	1.0	1.0	1.0
< 40	0.20 – 0.26	50	1.0	1.0	1.0	1.0	1.5

3.06 HVAC CONTRACT PIPING SYSTEM INSULATION SCHEDULE

A. Sub-Freezing Piping (0 to 39 degrees F) HVAC Piping Systems
   1. Style: Insulation shall be Style B
   2. Thickness:
      a. As per table 3.05, B above.
   3. Install on the following for the purpose of eliminating sweating:
      a. Refrigerant suction lines systems between evaporators and compressors.

B. Cold Piping (40 degrees F to ambient) HVAC Piping Systems
   1. Style: Insulation shall be Style A
   2. Thickness:
      a. As per table 3.05, B above.
   3. Install on the following for the purpose of eliminating sweating:
      a. Air conditioner condensate drain piping systems.

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C. Hot Low Pressure (to 250 degrees F) HVAC Piping Systems
   1. Style: Insulation shall be Style B
   2. Thickness:
      a. As per table 3.05, B above.
   3. Install on the following for the purpose of reducing heat loss and preventing injury to workers:
      a. Hot gas refrigerant piping systems

D. Exterior Piping Systems
   1. Style: Insulation shall be Style B.
   2. Thickness: Insulation shall be a minimum 2-inches thick

E. Insulation Omitted: Omit insulation on hot piping within radiation enclosures or unit cabinets, on cold piping within unit cabinets provided that the piping is located over a drain pan and on heating piping beyond a control valve, located within heated space.

F. Refer to Paragraph 3.07 in this section for more requirements.

G. Insulation Omitted: Omit the insulation on chrome-plated exposed piping (except for handicapped fixtures), air chambers, unions, strainers, check valves, balance cocks, flow regulators, drain lines from water coolers, drainage piping located in crawl spaces or tunnels, buried piping, fire protection piping, and pre-insulated equipment.

3.07 HVAC INSULATION INSTALLATION

A. General
   1. The HVAC insulation shall be applied on clean dry surfaces only. It shall be continuous through wall and ceiling openings and sleeves. All removable or openable parts such as casing and access doors shall be insulated so that the item can be opened or removed without damage to the insulation or finish.
   2. Insulation on all cold surfaces shall be applied with a continuous, unbroken vapor seal.
   3. The insulation shall pass through the hanger uninterrupted.
      a. All piping insulation shall be continuous through the hanger without interruption, and a protection system shall be used. The system shall consist of a block of molded calcium silicate or cellular glass insulation whose thickness and temperature rating shall be compatible with the insulation requirements of the piping system served and a metal shield. The blocking shall be a minimum of 12 inches long, cover the bottom half of the pipe and be secured to the piping to prevent shifting.

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b. The metal shield shall be 300 series stainless steel matching the curvature and covering the blocking. The metal gauge shall be as follows:

	Nominal Pipe Size	Metal Gauge
1)	Up to 6 inches	16
2)	6 to 10 inches	14
3)	12 inches and over	12

c. The length of the metal shield shall be 12 inches or match the length of blocking used. The shield shall cover the bottom half of the pipe.

B. Testing

1. All tests shall be performed in accordance with the requirements of Division 1.
2. The insulation, composite and accessories shall be tested in accordance with ASTM E84, NFPA 255 or UL723.

END OF SECTION 15081

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SECTION 15090

PIPE SUPPORT SYSTEMS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. This Section includes all pipe support systems as shown on the Drawings.

1.02 REFERENCES

A. American National Standards Institute (ANSI)
   1. B31.1, Power Piping
   2. B31.3, Chemical Plant and Petroleum Refinery Piping

B. American Society for Testing and Materials (ASTM)
   1. A276, Standard Specification for Stainless and Heat Resisting Steel Bars and Shapes
   2. A575, Standard Specification for Steel Bars, Carbon, Merchant Quality

C. American Welding Society (AWS)
   1. D1.1, Structural Welding Code

D. Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS)
   1. SP58, Pipe Hangers and Supports - Materials and Design
   2. SP69, Pipe Hangers and Supports - Selection and Application

1.03 DESIGN

A. Assure design, materials of construction and installation of pipe hangers, supports, guides, restraints, and anchors for air and process piping are in accordance with ANSI B31.3, and MSS Standard SP-58 and SP-69, except where modified by this Specification. For steam and hot and cold water piping, assure design, materials of construction and installation of pipe hangers, supports, guides, restraints, and anchors are in accordance with ANSI 31.1, and MSS SP-58 and SP-69.

1.04 SUBMITTALS

A. Certifications that products used meet standards referenced.

B. Shop Drawings consistent with Section 01300 and including:
   1. Product technical data
   2. Scaled drawing showing guides, hangers, supports, anchors, structural members and appurtenances used for pipe support system.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Concrete Inserts (Continuous Slot)
   1. Products as manufactured by Unistrut (P3200), or approved equal, and which meet these Specifications.

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B. Concrete Inserts (Individual Slot)
   1. Products as manufactured by Anvil (Figure 281), or approved equal, and which meet these Specifications.

C. Concrete Inserts (Self Drilling Expansion Anchor)
   1. Products as manufactured by Phillips (Flush End of Snap Off End Type), or approved equal, and which meet these Specifications.
   2. Provide stainless steel anchorage for exposed and submerged locations.

D. Pipe Hangers
   1. Products as manufactured by Anvil (Figure 260SS), or approved equal, and which meet these Specifications.

E. Stanchion Pipe Supports
   1. Products as manufactured by Standon (Model C-92) with Anvil (Figure 137SS) U-Bolt, or approved equal, and which meet these Specifications.

F. Offset Pipe Clamps
   1. Products as manufactured by Elcen (Figure 44), or approved equal, and which meets these Specifications. Pipe clamps shall be 316 stainless steel.

G. Flanged Cradle Pipe Support
   1. Products as manufactured by Standon (Model S-96), or approved equal, and which meet these Specifications.

H. Rigid Pipe Supports
   1. Products as manufactured by Standon (Model S-89) with B3088 base, or approved equal, and which meet these Specifications.

I. Wall Brackets
   1. Products as manufactured by Anvil (Figure 195 or 199), or approved equal, and which meet these Specifications.

J. Channel Frame Pipe Supports
   1. Products as manufactured by Unistrut Corporation, Powerstrut, Inc, or approved equal, and which meet these Specifications.

2.02 COMPONENTS

A. All structural steel angles, rods, channels, and special devices integral to hanger and support system shall be stainless steel unless otherwise noted on drawings.

B. Hanger Rods
   1. ASTM A276 in wet/corrosive areas
   2. ASTM A575 in non-corrosive areas
   3. Maximum total hanger load
      a. 3/8-inch diameter (min) rod: 610 LBS
      b. 1/2-inch diameter rod: 1,130 LBS
      c. 5/8-inch diameter rod: 1,810 LBS
      d. 3/4-inch diameter rod: 2,710 LBS

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e. 7/8-inch diameter rod: 3,770 LBS
f. 1-inch diameter rod: 4,960 LBS

4. Continuous thread type with rods electro-galvanized or cadmium plated after threads are cut except where stainless steel is specified.

C. Expanding pipe supports: Spring hangers conforming to MSS-SP58

D. Trapeze Hangers
1. Galvanized angle iron, channels or other structural shapes unless otherwise noted on drawings
2. Provide either curved or roller surfaces at support point corresponding with type of hanger scheduled.

E. Anchors and Alignment Guides
1. Stainless steel anchors and alignment guides.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation, inspect and verify condition of substrate. Installation constitutes installer's acceptance of substrate for satisfactory installation.

B. Prior to installation, inspect and verify condition of pipe support system. Installation constitutes installers acceptance of condition for satisfactory installation.

3.02 PREPARATION

A. Correct defects or conditions which may interfere with or prevent a satisfactory installation.

3.03 ERECTION/INSTALLATION/APPLICATION

A. Install in accordance with manufacturer's instructions

B. Locate hangers, supports, and accessories to support pipe system at concentrated loads and in accordance with minimums defined in MSS-SP69.

C. Install supports capable of supporting the pipe for service and testing conditions shown on piping Specification Schedules. Allow free expansion and contraction of the piping to prevent excessive stress resulting from service and testing conditions or from weight transferred from the piping or attached equipment.

D. All piping systems and pipe connections to equipment shall be properly anchored and supported to prevent undue deflection, vibration, dislocation due to seismic events and line pressures, and stresses on piping, equipment, and structures.

E. Provide piping systems exhibiting pulsation, vibration, swaying, or impact with suitable constraints to correct the condition. Movements from trap discharge, water hammer, and similar internal forces are included in this requirement.

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F. Weld supports in accordance with the requirements of AWS Code D1.1 Structural Welding. Weld anchors to pipe in accordance with ANSI B31.3.

G. Locate piping and pipe supports as to not interfere with open accesses, walkways, platforms, and with maintenance or disassembly of equipment.

H. Support vertical pipe runs in pipe chases at base of riser and at each floor. Support pipes for lateral movement with clamps or brackets.

I. Install individual or continuous slot concrete inserts for use with hangers for piping and equipment. Furnish and install concrete inserts as concrete forms are installed.

J. Size hangers to fit around outside of pipe insulation.
   1. Provide a pipe covering protection saddle for insulated hot pipe 4-inch and larger at support point.
   2. Install a 16-inch length of 9 LB density fiberglass pipe insulation between pipe and hanger or support for insulated piping without saddles.
   3. Insert to cover lower half of pipe utilizing insulation suited to pipe temperature.
   4. Thickness of pipe covering protection saddle and 9 LB density fiberglass to match final insulation thickness.

K. Provide pipe anchors to prevent movement of pipe at point of attachment.

L. Install pipe alignment guides on both sides on each expansion joint or loop to assure proper alignment of expanding and contracting pipe. Guides are not substitutes for hangers or other pipe supports. Provide two guides before and after each expansion joint/loop. Locate the first guide four pipe diameters away from the joint/loop, the second guide 10-12 pipe diameters from the first. Provide additional guides 75 ft on center thereafter unless anchors are present in that distance.

M. Suspend piping installed on galvanized steel trapeze hangers from concrete inserts or approved structural clips.

N. Provide wall bracket supports for pipe located near walls and 8 ft or more above floor elevation.

O. Provide pipe support saddles for pipe located 3 ft or less from the floor elevation in lieu of hangers.
   1. Use schedule 40 stainless steel support pipe risers recommended by saddle manufacturer.
   2. Provide steel floor plate with collar 3/16-inch thickness, circular in shape, and sleeve type connection to pipe.
   3. Size floor plate 4-inch larger than support pipe.
   4. Fit collar over outside of support pipe and extend up 2-inch from the floor plate.
   5. Weld floor plate to collar and grind all edges smooth. Hot-dip galvanized assembly after fabrication.

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P. For hangers placed directly on copper pipes, use copper or cadmium plated type hangers or isolate copper pipe from steel hanger with electrically insulating material. For all other applications use hangers cadmium plated or galvanized.

Q. Adjust supports and hangers to allow for proper pitch of pipes.

R. Where more than two pipes run parallel, support using trapeze hanger or individual hangers.

S. Secure channel frame pipe supports to walls or floors using suitable anchors.

3.04 FIELD QUALITY CONTROL

A. After erection of piping systems, and prior to pipe testing and flushing, inspect hangers for design offset, adequacy of clearance for piping and supports in the hot and cold positions, guides to permit movement without binding, and adequacy of anchors.

3.05 SCHEDULE

A. In certain locations, pipe supports, anchors, and expansion joints have been indicated on the drawings, but no attempt has been made to indicate every pipe support, anchor, and expansion joint. It shall be the CONTRACTOR's responsibility to provide a complete system of pipe supports, to provide expansion joints, and to anchor all piping, in accordance with the following minimum requirements:

1. Steel, stainless steel and ductile iron pipe support schedule.

Pipe sizes - IN	Maximum Spacing Between Supports - FT
1-1/2 and less	5
2 thru 4	10
5 thru 8	15
10 and greater	20

2. Copper pipe support schedule

Pipes Sizes - IN	Maximum Spacing Between Supports - FT
2-1/2 and less	5
3 thru 6	10
8 and greater	15

3. Plastic pipe support schedule

Pipes Sizes - IN	Maximum Spacing Between Supports - FT *
1-1/4 and less	3
1-1/2 thru 3	4

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4 and greater	5

* Maximum fluid temperature of 100 deg F.

4. Miscellaneous. Space supports for soil and waste pipe and other piping systems, not included above, every 5 feet.
5. Where mechanical coupling or expansion joints are used, place hanger within 2 feet of each side of fittings to keep pipes in alignment.
6. Provide at least one support for each length of pipe, at each change of direction and at each valve.
7. Above spacing is a minimum and where shown on the Drawings shall be installed in those locations.

B. Pipe supports and expansion joints are not required in buried piping, unless shown on the drawings or specified in other sections. Concrete blocking or other suitable anchorage for buried piping shall be provided as indicated on the drawings or specified in other sections.

C. All piping shall be rigidly supported and anchored so that there is no movement or visible sagging between supports.

END OF SECTION 15090

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SECTION 15100

VALVES AND APPURTENANCES

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals required and install complete and ready for operation all valves and appurtenances as shown on the Drawings and as specified herein.

B. The equipment shall include, but not be limited to, the following:
   1. Plug valves
   2. Ball valves
      a. PVC
      b. Stainless Steel
   3. PVC Dampers
   4. Check valves
   5. Duckbill check valves
   6. Valve boxes
   7. Hose bibbs
   8. Wash hose stations
   9. Pressure gauges
   10. Wastewater air release valves

C. The SJCUD's Manual of Water, Wastewater, and Reclaimed Water Standards Manual, issued January 2021 or latest version will be used for the following items:

1.	Check Valves	Section 2.18.12 and Section 3.8.3
2.	Plug Valves	Section 3.8.4
3.	Air Release Valves	Section 3.8.5
4.	Valve Boxes	Section 3.8.7

   a. These items must conform to those standards and shall be submitted for review and approval to the ENGINEER under this specification section.

D. All valves or appurtenances that come into contact with potable water shall be certified as NSF 61 and NSF-372 (NSF 61-G) approved.

1.02 RELATED WORK

A. Excavation, Backfill, Fill and Grading for pipe is included in Division 2.

B. SJCUD Standards latest edition.

1.03 DESCRIPTION OF SYSTEMS

A. All of the equipment and materials specified herein are intended to be standard for use in controlling the flow of water, wastewater, air, sludge, or chemicals, etc., depending on the applications.

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1.04 QUALIFICATIONS

A. All of the types of valves and appurtenances shall be products of well established reputable firms who are fully experienced, reputable and qualified in the manufacture of the particular equipment to be furnished. The equipment shall be designed, constructed and installed in accordance with the best practices and methods and shall comply with these specifications as applicable.

1.05 SUBMITTALS

A. Complete shop drawings of all valves and appurtenances shall be submitted to the ENGINEER for approval in accordance with the requirements of Section 01300.

B. Valve Submittals
   1. Valve tag number
   2. The manufacturer and supplier
   3. The address at which equipment will be fabricated or assembled
   4. Drawings showing assembly details, materials of construction and dimensions
   5. Descriptive literature, bulletins and/or catalogs of the equipment
   6. The total weight of each item
   7. A complete bill of materials
   8. Additional submittal data, where noted with individual pieces of equipment
   9. Actuator mechanical outline and electrical drawings with valve tag information
   10. Wiring diagrams, field wiring terminal diagrams, power requirements, and control panel drawings

C. Test Reports
   1. Provide certified hydrostatic test data, per manufacturer's standard procedure or MSS-SP-61 for all valves.
   2. Each actuator shall be performance tested in accordance with AWWA and other standards. The valve manufacturer shall supply, mount, and test all electric actuators on valves at the factory.

D. Certificates
   1. For each valve specified to be manufactured, tested and/or installed in accordance with AWWA and other standards, submit an affidavit of compliance with the appropriate standards, including certified results of required tests and certification of proper installation.

E. Operation and maintenance manuals for each type valve in accordance with Section 01370.

1.06 SPARE PARTS AND TOOLS

A. Special tools, if required for normal operation and maintenance shall be supplied with the equipment.

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1.07 VALVE DESIGNATIONS AND SCHEDULE

A. All valves shall be identified by a unique valve tag as identified in the valve schedule prepared by the CONTRACTOR. The specific type of valve to be used will be identified by the symbol and/or call out on the Drawings. The CONTRACTOR shall identify each valve by its assigned tag number on all shop drawings and equipment submittals or as designated on the drawings.

B. The CONTRACTOR shall refer to the P&IDs and Mechanical Plans for type of each valve called out by abbreviation or drawing symbol. Prior to the first valve submittal, CONTRACTOR shall submit a detailed valve schedule listing all of the process valves to be furnished along with the Contract Drawing P&IDs edited electronically which shall include the valve tag numbers prepared by the CONTRACTOR identifying each valve. The valve schedule shall include: valve tag number, valve designation, valve size, end connections, operator type and other information required by SJCUD details for buried valves. The valve tag shall be 4 digits long; numbering shall be linked to the P&ID Sheet on which it is shown. Identical valves in the same position in parallel processes (EX. Pump inlet/outlet isolation valves where there are 3 parallel pumps of same type) shall have same tag number followed by a hyphen and quantifier -1, 2, 3 etc. Where electric, hydraulic or pneumatic actuators are supplied their type shall be so noted with an E, H or P. Modulating duty actuators shall be noted with an M following the actuator type notation. An excerpt of an EXAMPLE schedule is as follows:

Valve Tag.	Designation	Size	Ends	Operator	Notes
1000-1	BFV1	8-in	Flanged	Gear/Handwheel	Extra description necessary
1000-2	BFV1	8-in	Flanged	Gear/Handwheel	
1005	PV1	6-in	Flanged	EM	

C. Valve tags shall comply with requirements of SJCUD Standards Manual.

1.08 WARRANTY

A. All equipment supplied under this section shall be warranted for a period of one (1) year from substantial completion by the MANUFACTURER.

B. The equipment shall be warranted to be free from defects in workmanship, design and materials. If any part of the equipment should fail during the warranty period, it shall be replaced in the machine(s) and the unit(s) restored to service at no expense to the OWNER.

C. The MANUFACTURER'S warranty period shall run concurrently with the CONTRACTOR'S warranty period. No exception to this provision shall be allowed.

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PART 2- PRODUCTS

2.01 GENERAL

A. All valves and appurtenances shall be of the size shown on the Drawings and as far as possible all equipment of the same type shall be from one manufacturer.

B. All valves and appurtenances shall have the name of the maker and the working pressure for which they are designed cast in raised letters upon some appropriate part of the body.

C. The valve manufacturer shall supply, mount, and test all actuators on valves at the factory. The valves and their individual actuators shall be shipped as a unit.

D. Unless otherwise noted on the Drawings, valves shall be manually actuated; non-buried valves shall have an operating wheel, handle or lever mounted on the operator; those with operating nuts shall have a non-rising stem with an AWWA 2-inch nut. At least two tee handles shall be provided for all operating nuts. Unless otherwise noted, operation for all valves shall be CCW open.

E. Each operating device shall have cast on it with the word “OPEN” and an arrow indicating the direction of operation.

F. Buried valves shall have nut operator and valve box arrangement as shown on the Drawings.

G. All actuators shall be capable of moving the valve from the full open to full close position and in reverse and holding the valve at any position part way between full open or closed.

H. For all valves, all exposed hardware including nuts and bolts shall be 316 stainless steel and shall remain unpainted to allow easy removal.

2.02 PLUG VALVES

A. Two-way plug valves shall meet the standard specifications as listed in Section 3.8.4 of SJCUD Standards Manual.

B. Three-way plug valves shall be a three-way tapered Combination 0 plug valve. Valves shall be ductile iron body per ASTM A351 Grade CF8M. Valve shall be handwheel operated in the mounting position indicated on the Drawings.

2.03 BALL VALVES

A. PVC

1. Ball valves for PVC pipe shall be of PVC Type 1 with union, socket, threaded or flanged ends as required. Ball valves shall be full port, full flow, all plastic construction, 150 psi rated with Teflon seat seals and T-handles. PVC ball valves shall be as manufactured by Celanese Piping Systems, Inc., Wallace and Tiernan Inc., Plastiline, Inc., or equal.

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2. All valves shall be mounted in such a position that valve position indicators are plainly visible when standing on the floor.

B. Stainless Steel
1. Ball valves shall be 316 stainless steel body per ASTM A351 Grade CF8M, two piece split body, full port, and fire safe as per API 607 4th edition.
2. Ball valves shall be manufactured with 150 lb flanges.
3. The design of the valves shall be such that it shall provide suitable seating in both directions. In order to determine the position of the ball within the valve (open or closed), there shall be an easily visible, permanent indicator on the valve. Ball valves shall have a 316 stainless steel ball.
4. Seats shall be TFM 1600 enhanced Teflon seats. The fully open port area shall be approximately 100 percent of the nominal pipe area.
5. Valve shafts shall be ground and polished and shall be type 304 stainless steel Teflon-lined bearings shall be supplied in both trunnions of the valve body.
6. Stainless handles on sizes ½ – 2-inch with travel stops and lockout devices and carbon steel handles on sizes 2 ½ – 12-inch with travel stops and lock out devices.
7. Valves to be furnished with an actuator shall have ISO 5211 secure mount actuator mounting pad. Valve actuators shall conform to AWWA C507 as specified herein.
8. Stainless steel ball valves shall be model F150 as manufactured by Flo-tite, F15 by Flow-tek, Apollo Series 76, or Ohio Valve Fig. 166RT.

2.04 PVC DAMPERS

A. Dampers shall be wafer style. Valve body shall be polyvinyl chloride (PVC). Disc shall be polypropylene (PP). Damper seats and seals shall be EPDM. Stems shall be 316 stainless steel. Dampers shall be lever actuated and shall be manufactured by ASAHI YUKIZAI CORPORATION, or ENGINEER approved equal.

2.05 CHECK VALVES

A. Check valves shall meet the standard specifications as listed in Section 2.18.12 and 3.8.4 of SJCUD Standards Manual.

2.06 DUCKBILL CHECK VALVES

A. The overflow outlet from the new influent pump station into the existing wet well shall be through a flanged duckbill-style check valve that allow fluid to enter the vault during draining and prevents backflow into the wet well.

B. The duckbill style nozzles shall be one-piece EPDM elastomer matrix with internal fabric reinforcing. The flange portion shall be an integral portion of the nozzle with fabric reinforcing spanning across the joint between the flange and nozzle body. The elastomer used in construction of the duckbill valves must have been tested by an accredited independent laboratory that confirmed there is no degradation in the elastomer when exposed to chlorine and chloramine per the ASTM D471-98 “Standard Test Method for Rubber Property – Effect of Liquids.”

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C. Manufacturer shall have at least ten (10) years' experience in the manufacturing of "duckbill" style elastomeric valves. The manufacturer's name, plant location, serial number and product part number which designates nozzle size, material and construction specifications shall be bonded onto the surface of the nozzle.
   1. The duckbill check valve shall be a Tideflex Series 35-1 as manufactured by the Red Valve Company, Inc. or ENGINEER approved equal.

2.06 VALVE BOXES

A. Valve boxes shall meet the standard specifications as listed in Section 3.8.7 of SJCUD Standards Manual.

2.07 HOSE BIBBS

A. Hose bibbs shall be brass, polished chromium plated, as manufactured by Chicago Faucet Company. Potable water bibbs shall be No. 952, 1-inch with vacuum breaker and shut off valve as detailed on the Drawings.

B. CONTRACTOR shall provide hose, mounting hardware and supports, and pipe supports at all locations as detailed on the drawings.

C. All non-potable water hose bibbs shall be installed with non-potable water signs. As per DEP Rule 62-610.469, non-potable water hose bibbs shall be labelled as non-potable with signs stating "DO NOT DRINK" in English and in Spanish.

2.08 WASH HOSE STATION

A. Shall be a single supply, wall-mounted, guardrail mounted, or free standing hose station as shown on the Drawings.

B. Hoses shall be red, 1-inch rubber at all locations.

C. Hose nozzle shall be lever operated, encased in rubber equal to Strahman No. 70.

D. Wall anchors for hose rack shall be 5/16-inch 316 stainless steel hex bolts.

E. Isolation valve shall be a stainless-steel ball valve as specified herein.

2.09 PRESSURE GAUGES

A. Each pressure gauge shall be direct mounted, 304 SS with a minimum 4 inch diameter dial and furnished with a clear glass window, ¼ inch shut-off valve, and a bronze pressure snubber. Provide diaphragm seals between shut-off valve and pressure gauge. All gauges shall be weatherproofed. The face dial shall be white finished aluminum with jet black graduations and figures. The face dial shall indicate the units of pressure being measured (e.g., feet, inches, etc.) or be dual scale.

B. Pressure gauges shall be liquid filled and equal to Series 750 as manufactured by H.O. Trerice Co., Detroit, Michigan; Marshalltown Instruments, Marshalltown, Iowa; or equal.

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C. Install as per details provided on the drawings.

D. Gauge rating shall be the range as shown on the Drawings and confirmed during the shop drawing process, provide a table of all pressure gauges, location, application, and pressure range for review and approval.

E. Diaphragm seals shall be installed for all pressure gauges and pressure switches to protect pressure gauges and pressure switches from contact with the fluid in the pipeline. Gauges shall be furnished as part of a complete factory assembly including gauge, snubber, diaphragm seal, liquid fill, bar stock isolation valve and threaded Type 316 stainless steel interconnecting piping. Furnish also a ½-in backflushing connection and valve.

F. Diaphragm seals shall be minimum 2-1/2-inch diameter, or as required for the connected pressure gauges. The diaphragm shall be “thread attached” to both piping and pressure switches or gauges. Furnish mineral oil fill between the diaphragm seal and the gauge.
   1. Diaphragm seals shall have an upper housing of Type 316 stainless steel, with the lower housing of a material specifically chosen according to the fluid type and pressure being monitored, with Type 316 stainless steel bolts. Diaphragms shall be Type 316 ELC stainless steel.
   2. Each diaphragm seal shall be connected to its respective piping or equipment with threaded Type 316 stainless steel pipe and fittings. Pipe size and diaphragm tap size shall match the size of the gauge tap on the equipment, but shall not be less than ¾-inch, except for connections to plant water piping which shall be minimum ½-inch. Furnish a plug valve shut-off valve between the pipeline or equipment and the diaphragm seal.
   3. Each diaphragm seal shall have a minimum ¼-inch NPT flush connection with plug valve and gauge tap to match the size of the gauge.
   4. Furnish pulsation dampeners adequate to prevent pulsation and/or vibration of the gauge indicator under all system operating conditions.

2.10 AIR RELEASE VALVES

A. Air release valves shall meet the standard specifications as listed in Section 3.8.5 of SJCUD Standards Manual.

B. The CONTRACTOR shall provide connecting piping, valves, and appurtenances as shown on the Drawings and route to the drain as shown.

PART 3- EXECUTION

3.01 INSTALLATION

A. All valves and appurtenances shall be installed in the locations shown, true to alignment and rigidly supported. Any damage to the above items shall be repaired to the satisfaction of the ENGINEER before they are installed.

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B. After installation, all valves and appurtenances shall be tested at least 2 hours at the working pressure corresponding to the class of pipe, unless a different test pressure is specified. If any joint proves to be defective, it shall be repaired to the satisfaction of the ENGINEER.

C. Install all floor boxes, brackets, extension rods, guides, the various types of operators and appurtenances as shown on the Drawings that are in masonry floors or walls, and install concrete inserts for hangers and supports as soon as forms are erected and before concrete is poured. Before setting these items, the CONTRACTOR shall check all plans and figures which have a direct bearing on their location and he shall be responsible for the proper location of these valves and appurtenances during the construction of the structures.

D. Pipe for use with flexible couplings shall have plain ends as specified in the respective pipe sections in Division 15.

E. Fire and yard hydrants shall be set at the locations designated by the ENGINEER and bedded on a firm foundation. Each hydrant shall be set in true vertical alignment and properly braced. Concrete thrust blocks shall be placed between the back of the hydrant inlet and undisturbed soil at the end of the trench. Minimum bearing area shall be as shown on the Drawings. Felt roofing paper shall be placed around hydrant elbow before placing concrete. If directed, the hydrant shall be tied to the pipe with suitable rods or clamps, galvanized, painted, or otherwise rustproof treated. Concrete used for backing shall be no leaner that 1 part cement, 2-1/2 parts sand, and 5-1/2 parts stone. Hydrant paint shall be touched up as required after installation.

F. Flanged joints shall be made with stainless steel bolts, nuts and washers. Mechanical joints shall be made with mild corrosion resistant alloy steel bolts and nuts. All exposed bolts shall be painted the same color as the pipe. All buried bolts and nuts shall be heavily coated with two (2) coats of bituminous paint comparable to Inertol No. 66 Special Heavy.

G. Yard hydrants shall be installed in accordance with manufacturer’s recommendation and applicable requirements of fire hydrants above.

H. Prior to assembly of split couplings, the grooves as well as other parts shall be thoroughly cleaned. The ends of the pipes and outside of the gaskets shall be moderately coated with petroleum jelly, cup grease, soft soap or graphite paste, and the gasket shall be slipped over one pipe end. After the other pipe has been brought to the correct position, the gasket shall be centered properly over the pipe ends with the lips against the pipes. The housing sections then shall be placed. After the bolts have been inserted, the nuts shall be tightened until the housing sections are firmly in contact, metal-to- metal, without excessive bolt tension.

I. Prior to the installation of sleeve-type couplings, the pipe ends shall be clean thoroughly for a distance of 8 inches. Soapy water may be used as a gasket lubricant. A follower and gasket, in that order, shall be slipped over each pipe to a distance of about 6 inches from the end, and the middle ring shall be placed on the already laid pipe end until it is properly centered over the joint. The other pipe end shall be inserted into the middle

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ring and brought to proper position in relation to the pipe already laid. The gaskets and followers shall then be pressed evenly and firmly into the middle ring flares. After the bolts have been inserted and all nuts have been made up finger tight, diametrically opposite nuts shall be progressively and uniformly tightened all around the joint, preferably by use of a torque wrench of the appropriate size and torque for the bolts.

J. Valve boxes with concrete bases shall be installed as shown on the Drawings. Mechanical joints shall be made in the standard manner. Valve stems shall be vertical in all cases. Place cast iron box over each stem with base bearing on compacted fill and top flush with final grade. Boxes shall have sufficient bracing to maintain alignment during backfilling. Knobs on cover shall be parallel to pipe. Remove any sand or undesirable fill from valve box.

3.02 SHOP PAINTING

A. Ferrous surfaces of valves and appurtenances shall receive an exterior coating of rust-inhibitive primer as specified in Section 09900. Interior coatings shall be the manufacturer's standard except that valves on raw and potable water pipes shall be coated with paints approved by both EPA and AWWA NSF 61 approved for potable water service. All pipe connection openings shall be capped after shop painting to prevent the entry of foreign matter prior to installation.

3.03 FIELD PAINTING

A. All valves and appurtenances specified herein and exposed to view will be painted as part of the work in Section 09900. All exposed pipe joints on pipe, valves and fittings shall be caulked 360 degrees prior to painting.

3.04 INSPECTION AND TESTING

A. Completed pipe and valves shall be subjected to hydrostatic pressure test for 2 hours at full working pressure. All leaks shall be repaired and lines retested as approved by the ENGINEER. Prior to testing, the gravity pipelines shall be supported in an approved manner to prevent movement during tests.

END OF SECTION 15100

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SECTION 15120

PIPING SPECIALTIES

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. This Section specifies the basic piping specialties and testing requirements for piping. Specific piping materials, systems and related installation and testing requirements are provided in the respective sections.

B. The items shall include the following:
1. Unions
2. Flanged Joints
3. Plugs and Caps
4. Miscellaneous Adaptors
5. Service Saddles
6. Quick Connect Couplings
7. Mechanical Sleeve Seals
8. Harnessing and Restraints
9. Harnessed Flange Adapter Couplings (HFAC)
10. Restrained Dismantling Joints
11. Appurtenances and Miscellaneous Items
12. Hose End Valves
13. Clean Outs

1.02 RELATED WORK

A. Piping materials and systems are included in other Sections of Division 15.

B. Valves are included in Section 15100.

1.03SUBMITTALS

A. Submit, in accordance with Section 01300, general submittals for piping, piping systems and pipeline appurtenances are listed below. It is not intended that all submittals listed below be provided for all piping materials and systems.

B. Shop Drawings and Product Data
1. Piping layouts in full detail.
2. Location of pipe hangers and supports.
3. Location and type of backup block or device to prevent joint separation.
4. Large scale details of wall penetrations and fabricated fittings.
5. Schedules of all pipe, fittings, special castings, couplings, expansion joints and other appurtenances.
6. Catalog cuts of joints, couplings, harnesses, expansion joints, gaskets, fasteners and other accessories.
7. Catalog cuts of all pipeline appurtenances specified herein.
8. Brochures and technical data on coatings and linings and proposed method for application and repair.

C. Test Reports
1. Copies of certified shop tests showing compliance with appropriate standard.

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2. Copies of all field test reports, signed by CONTRACTOR.

D. Certificates
1. Copies of certification for all welders performing work in accordance with ANSI 831.1.

E. Manufacturers Installation (or application) instructions

F. Operation and Maintenance Data in accordance with Section 01730

G. Warranties in accordance with Section 01740

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)
1. ASTM A36 - Standard Specification for Carbon Structural Steel
2. ASTM Al26 - Standard Specification for Gray Iron Casting for Valves, Flanges and Pipe Fittings
3. ASTM Al83 - Standard Specification for Carbon Steel Track Bolts and Nuts
4. ASTM A278 - Standard Specification for Gray Iron Castings for Pressure-Containing Parts for Temperatures up to 650 Degrees F
5. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
6. ASTM A325 - Standard Specification for Strength Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
7. ASTM A536 - Standard Specification for Ductile Iron Castings
8. ASTM A575 - Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades
9. ASTM 862 - Standard Specification for Composition Bronze or Ounce Metal Castings
10. ASTM 888 - Standard Specification for Seamless Copper Water Tube

B. American National Standards Institute (ANSI)
1. ANSI A 13.1 - Scheme for the Identification of Piping Systems
2. ANSI BI. I - Unified Inch Screw Threads (UN and UNR Thread Form)
3. ANSI B 18.2 - Square and Hex Bolts and Screws Inch Series Including Hex Cap Screws and Lag Screws
4. ANSI B3 I - Code for Pressure Piping
5. ANSI B3 l.1 - Power Piping

C. American Society of Mechanical Engineers (ASME)
1. ASME B2. 1 - Specifications, Dimensions, Gauging for Taper and Straight Pipe Threads (except dry seals)
2. ASME B 16.1 - Cast Iron Pipe Flanges and Flanged Fittings
3. ASME B16.5 - Pipe Flanges and Flange Fittings

D. American Welding Society (AWS)
1. A WS B3.0 - Welding Procedure and Performance Qualifications

E. American Water Works Association (AWWA)

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1. A WWA C 110 - Ductile-Iron and Gray-Iron Fittings, 3-inch Through 48-inch (75mm Through 1200mm), for Water and Other Liquids
2. A WWA Cl 11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
3. A WWA C219 - Bolted Sleeve-Type Couplings for Plain-End Pipe
4. A WW A C606 - Grooved and Shouldered Joints
5. A WW A Manual Ml 1 - Steel Pipe - A Guide for Design and Installation

F. Plumbing and Drainage Institute (POI)
1. WH 201 - Water Hammer Arrestors

G. Underwriters Laboratories (UL)

H. Factory Mutual (FM)

I. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

A. All materials shall be new and unused.

B. The CONTRACTOR shall install piping to meet requirements of local codes.

C. The CONTRACTOR shall provide manufacturer's certification that materials meet or exceed minimum requirements as specified.

D. The CONTRACTOR shall coordinate dimensions and drilling of flanges with flanges for valves, pumps and other equipment to be installed in piping systems. Bolt holes in flanges to straddle vertical centerline.

E. The CONTRACTOR shall reject materials contaminated with gasoline, lubricating oil, liquid or gaseous fuel, aromatic compounds, paint solvent, paint thinner and acid solder.

F. Pipe-joint compound, for pipe carrying flammable or toxic gas, must bear approval of UL or FM.

G. Unless otherwise specified, pressures referred to in all piping sections are expressed in pounds per square inch, gauge above atmospheric pressure, psig and all temperature are expressed in degrees Fahrenheit (F).

1.06 DELIVERY, STORAGE, AND HANDLING

A. During loading, transportation and unloading, take care to prevent damage to pipes and coating. Carefully load and unload each pipe under control at all times. Place skids or blocks under each pipe in the shop and securely wedge pipe during transportation to ensure no injury to pipe and lining. Cover or cap all pipe ends while pipe is in storage, until it is made a part of the work.

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1.07 WARRANTY

A. All equipment supplied under this section shall be warranted for a period of one (1) year from substantial completion by the MANUFACTURER.

B. The equipment shall be warranted to be free from defects in workmanship, design and materials. If any part of the equipment should fail during the warranty period, it shall be replaced in the machine(s) and the unit(s) restored to service at no expense to the OWNER.

C. The MANUFACTURER'S warranty period shall run concurrently with the CONTRACTOR'S warranty period. No exception to this provision shall be allowed.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Specific piping materials and appurtenances are specified in the respective piping or system sections or as shown on the Drawings. The use of a manufacturer's name and/or model number is for the purpose of establishing the standard of quality and general configuration desired.

B. Equipment shall be of the size shown on the Drawings or as noted and as far as possible equipment of the same type shall be identical and from one manufacturer.

C. Equipment shall have the name of the maker, nominal size, flow directional arrows (if applicable), working pressure for which they are designed and standard referenced specifications cast in raised letters or indelibly marked upon some appropriate part of the body.

D. Unless otherwise noted, items shall have a minimum working pressure of 150 psi or be of the same working pressure as the pipe they connect to, whichever is higher and suitable for the pressures noted where they are installed.

2.02 UNIONS

A. Unions shall be brass or bronze unions for joining nonferrous pipe; malleable brass or bronze-seated iron or steel unions for joining ferrous pipe; PVC unions for joining PVC pipe; CPVC unions for joining CPVC pipe.

B. Unions shall be provided at valve locations whether they are or are not shown on the Drawings.

2.03 PLUGS AND CAPS

A. Provide standard plug or cap as required for testing; plugs, caps suitable for permanent service.

B. Plug or cap or otherwise cover all piping work in progress.

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2.04 MISCELLANEOUS ADAPTORS

A. Between different types of pipe and/or fittings special adapters may be required to provide proper connection. Some of these may be indicated on the Drawings or specified with individual types of pipe or equipment. However, it is the CONTRACTOR's responsibility to ensure proper connection between various types of pipe, to structures and between pipe and valves, gates, fittings, and other appurtenances. Provide all adapters as required, whether specifically noted or not.

B. As required, these adapters shall be suitable for direct bury, with proper dielectric insulation and as a minimum, if metallic (not stainless steel or galvanized), with two coats of coal tar epoxy.

2.05 SERVICE SADDLES

A. Service saddle for outlet sizes up to 2-inch shall be duel band, anchored by a minimum of four bolt pattern on a fused epoxy coated ductile iron saddle body. Service saddles shall have BUNA-N rubber gaskets cemented to the saddle body and shall utilize the wide stainless steel band sized exactly to the pipe outside diameter. Bodies shall be tapped for IPS. All hardware shall be 316 stainless steel. Service saddles shall be manufacturer by Ford or Smith Blair.

B. Tapping sleeves shall be provided for outlets larger than 2-inches and shall meet the standard specifications as listed in Section 3.10.2 of SJCUD Standards Manual.

2.06 QUICK CONNECT COUPLINGS

A. Couplings shall be of the cam and groove type consisting of a male adapter conforming to MIL-C-27487. Male adapters shall be designed to receive a female coupler without requiring threading, bolting, or tools. Connections shall remain tight and leakproof under pressures up to 100 psig. Each adapter shall be furnished with a dust cap complete with an 18-inch long security chain of corrosion resistant material. Couplings shall be by Civacon, a Division of Dover Corporation; Ever-tite or equal. Units shall be "drip proof", providing totally dry connections and dis-connections.

B. Adapters shall be furnished in accordance with the Drawings, or as required by the installation.

2.07 MECHANICAL LINK SLEEVE SEALS

A. Mechanical sleeve seals shall be used to secure and seal the annular space around all new sleeved and core-drilled wall penetrations.

B. A single seal or double seal shall be provided for sleeve and cores in walls as shown on the Drawings.

C. Galvanized steel wall sleeves and concrete core diameter shall be sized sufficiently larger to accommodate the modular elements, per the manufacturer's recommendations.

D. Bolts and hardware shall be carbon steel, zinc-plated. Pressure plates shall be

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corrosion-resistant acetal resin.

E. Mechanical link sleeve seals shall consist of modular bolted, synthetic rubber sealing elements, Link Seal by Thunderline Corp. or equal.

2.08 HARNESSING AND RESTRAINT

A. Where harnessed couplings or adapters are noted, they shall conform to AWWA Manual M 11 except as modified by the Drawings or this Section.

B. Unless otherwise noted, size and material for tie rods, clamps, plates and hex nuts shall be as shown on the Drawings, or, if not shown on the Drawings, shall be as required in AWWA Manual M 11. Manufactured restraining clamp assemblies shall be as manufactured by Stellar Corporation, Columbus, OH, or equal.

C. Restrained joints (such as welded, locking mechanical joints) shall be of the type specified with the individual type of pipe. If not specified, restrained (locking) mechanical joint pipe shall be of the manufacturer's standard design utilizing a locking device (ring or ears) integrally cast with the pipe.

D. For up through 18-inch diameter ductile iron pipe only, the following may be used as an alternative to other restraint system:
   1. The optional mechanical joint restraints shall be incorporated in the design of a follower gland. The gland shall be manufactured of ductile iron conforming to ASTM A536. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell and tee-head bolts as specified with the pipe.
   2. The restraint mechanism shall consist of numerous individually activated gripping surfaces to maximize restraint capability. The gripping surfaces shall be wedges designed to spread the bearing surfaces on the pipe. Twist-off nuts, sized same as tee-head bolts, shall be used to ensure proper actuating of restraining devices. When the nut is sheared off, standard hex nut shall remain.
   3. The mechanical joint restraint device for ductile iron pipe shall have a working pressure of at least 250 psi with a minimum safety factor of 2: 1.
   4. The mechanical joint restraint devices shall be of the type listed below or equal.
   5. For ductile iron pipe: EBAA Iron, Inc. Megalug 1100 series.

E. The CONTRACTOR shall be responsible for anchorage including restraint as noted elsewhere in Division 15.

2.09 HARNESSED FLANGE ADAPTER COUPLINGS (HFAC)

A. Provide joints meeting the requirements of AWWA C.219 as applicable and with tie rods as shown on the drawings and called out as HFAC. All connecting hardware shall be type 316 stainless steel. The spigots and flange adapters shall be ductile iron or steel meeting ASTM A283 Grade C, and shall be provided with a shop-coat primer compatible with the field applied coating specified. The joints shall be a complete assembly consisting of a spigot piece, flange adapter, tie rods and gaskets. The tie rod

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restraint system shall be capable of withstanding the full pressure thrust that the pipe system can develop at no more than 50% of the yield strength of the tie rod material. The design pressure rating of the joints shall be equal to or greater than the mating flanges. Dismantling joints shall be type FCG by Romac Industries or ENGINEER approved equal.

2.10 RESTRAINED DISMANTLING JOINTS

A. The tie rod restraint system shall be capable of withstanding the full pressure thrust that the pipe system can develop at no more than 50 percent of the yield strength of the tie rod material. The design pressure rating of the dismantling joints shall be equal to or greater than the mating flanges or 175 psi, whichever is greater. Dismantling joints shall be type DJ 400 Dismantling Joints by Romac Industries, Dismantling Joints by Viking Johnson, Style 131 Dismantling Joints by Dresser Industries, or ENGINEER approved equal.

B. The flanged spool shall be constructed with an AWWA C207 Class D Steel Ring Flange and compatible with ANSI Class 125 and 150 bolt circles. Pipe shall be STD Weight Class per ASTM A53.

C. The end ring and body shall be made from ASTM A536 65-45-12 Ductile Iron.

D. Gaskets used for potable water systems should be meet the requirements of ASTM D 2000, be fusion bonded epoxy, and NSF 61 certified. All surfaces shall be coated, including flange faces.

E. Bolts, nuts, tie rods, and all other hardware shall be 316 stainless steel.

2.11 APPURTENANCES AND MISCELLANEOUS ITEMS

A. All gaskets, glands, bolts, nuts, and other required hardware shall be provided for connection of piping and appurtenances. Bolts and nuts shall be high strength, Type 316 stainless steel.

B. All gaskets for flanges shall be full face and suitable for 150 degrees F operating temperature, and the fluids carried and 300 degrees F for air services.

C. Plugs, caps and similar accessories shall be of the same material as the pipe and of the locking type, unless otherwise noted.

D. Unions shall be of the same material as the pipe, except for dielectric connections.

E. Special protective tape shall be fabric reinforced petroleum tape by Denso Inc., Houston, TX or equal.

2.12 HOSE END VALVES

A. Hose end valves shall be globe pattern valves, similar to Fairbanks Fig. 074; Jenkins Fig. 112 or equal. Furnish cap and chain.

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PART 3 - EXECUTION

3.01 GENERAL

A. All dirt, scale, weld splatter, water and other foreign matter shall be removed from the inside and outside of all pipe and sub-assemblies prior to installing.

B. All pipe joints and connections to equipment shall be made in such a manner as to produce a minimum of strain at the joint.

C. Install piping in a neat manner with lines straight and parallel or at right angles to walls or column lines and with risers plumb. Run piping to avoid passing through ductwork or directly under electric light outlets, and/or interference with other lines or extending beyond furring lines as determined by Architectural Drawings. All work shall be accomplished using recognized methods and procedures of pipe fabrication and in accordance with the latest revision of applicable ANSI Standards, ASME Codes and Pipe Fabrication Institute Standards.

1. Use full length of pipe except where cut lengths are necessary. Do not spring or deform piping to make up joints.

2. Pipe shall be cut square, not upset, undersize or out of round. Ends shall be carefully reamed and cleaned before being installed. Bending of pipe is not permitted. Use fittings for all changes in direction.

3. Do not use bushings except where specifically approved by the ENGINEER. Reducers shall be eccentric to provide for drainage from all liquid-bearing lines and facilitate air removal from water lines.

4. Verify the locations and elevations of any existing piping and manholes before proceeding with work on any system. Any discrepancies between the information shown on the Drawings and the actual conditions found in the field shall be reported at once to the ENGINEER. No claim for extra payment will be considered if the above provision has not been complied with.

5. Where pipes of lower service rating tie into services or equipment of higher service rating the isolation valve between the two shall conform to the higher rating.

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6. Mitering of pipe to form elbow is not permitted.

7. All piping interiors shall be thoroughly cleaned after installation and kept clean by approved temporary closures on all openings until the system is put in service. Open pipe ends shall be subjected to recleaning and retesting.

8. End caps on pre-cleaned pipe shall not be removed until immediately before assembly. All open ends shall be capped immediately after completion of installation.

9. Provide temporary strainers within the piping ahead of every piece of equipment. The strainers shalt be cleaned and reinserted immediately before start-up. The strainers shall be kept in service until at least 7 days after the equipment has been put in service.

D. Test Connections

1. Provide 1/2-inch female NPT test connection equipped with 1/2-inch brass plug on all pump suction and discharge pipes. Where indicated on the Drawings, test connections should be equipped with bar stock valve and gauge. Provide test connections at alt steam traps. The connection shall be located on the discharge side of the trap between the trap and the first valve. It shall consist of a 1/2-inch branch connection terminated with a gate valve.

E. Installation of Expansion Joints and Flexible Connectors

1. Piping systems shall be aligned prior to installation of expansion fittings. Alignment shall be provided by fitting a rigid pipe spool in place of the expansion joint. Prior to testing of the piping system, the pipe spool shall be replaced with the specified expansion or flexible fitting.

2. In addition to the locations noted on the Drawings and in PART 2, expansion fittings and anchors shall be located and spaced as specified by the Expansion Joint Manufacturer's Association. The expansion joints/flexible connectors shall not be installed during times of temperature extreme or in a fully compressed or fully expanded condition.

F. Installation of Sleeve Couplings

1. Unless otherwise required by the manufacturer's instructions, prior to installation of sleeve couplings, the pipe ends shall be cleaned thoroughly for a distance of at least 12-inch. Soapy water may be used as a gasket lubricant. A follower and gasket, in that order, shall be slipped over each pipe to a distance of about 6-inch from the end, the middle ring shall be placed on the already installed pipe and shall be inserted into the middle ring flair and brought to proper position in relation to the pipe already installed. The gaskets and followers shall then be pressed evenly and firmly into the middle ring flares.

2. After the bolts have been inserted and all nuts have been made up fingertight, diametrically opposite nuts shall be progressively and uniformly tightened all around the joint, preferably by use of a torque wrench of the appropriate size and torque for the bolts.

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3. The correct torque as indicated by a torque wrench shall not exceed 75 ft-lb for 5/8-inch bolts and 90 ft-lb for 3/4-inch bolts.

4. If a wrench other than a torque wrench is used, it should be no longer than 12-inch so that when used by the average person the above torque values shall not be exceeded.

5. To prevent sleeve couplings from pulling apart under pressure, a suitable harnessing or flange clamp assembly shall be provided and installed where shown on the Drawings, directed by the ENGINEER or required elsewhere under Division 15 concerning anchorage.

6. Note the additional locations required for sleeve couplings in PART 2. Also note CONTRACTOR's responsibility for locating, providing and installing restraints.

G. Installation of Split Couplings

1. Prior to assembly of split couplings, grooves or shoulders of the pipe as well as other parts shall be thoroughly cleaned. The ends of the pipes and outside of the gaskets shall be moderately coated with manufacturer's recommended lubricant, petroleum jelly, cup grease, soft soap, or graphite paste and the gasket shall be slipped over one pipe end. Lubricant shall be compatible with potable water application. After the other pipe has been brought to the correct position, the gasket shall be centered properly over the pipe ends with the lips against the pipes. The housing sections then shall be placed.

2. Ensure that the joints are fully extended after the rings are in place and prior to tightening the bolts. After the bolts have been inserted, the nuts shall be tightened until the housing sections are firmly in contact, as required by the manufacturer, without excessive bolt tension or strain on the pipe.

H. Installation of Pipeline Appurtenances

1. All pipeline appurtenances shall be installed as required and in accordance with the manufacturer's recommendations, as acceptable to the ENGINEER.

2. Gauges, meters and similar in-line items shall be isolated from testing pressures in excess of the rated pressure of the assembly.

3. Use Teflon tape on all screwed fittings.

I. Installation of Unions

1. Use unions to allow dismantling of pipe, valves, and equipment.

J. Welding

1. Welding shall be in accordance with ANSI 831 and A WS 83.0.

2. Install welding fittings on all welded lines. Make changes in direction and intersection of lines with welding fittings. Do not miter pipes to form elbows or notch straight runs to form tees, or any similar construction. Do not employ welder who has not been fully qualified in above specified procedure and so certified by approved welding bureau or similar locally recognized testing authority.

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K. Installation of Flanged Joints

1. Make flanged joints with bolts; bolt studs with nut on each end; or studs with nuts where one flange is tapped. Use number and size of bolts conforming to same ANSI Standard as flanges. Before flanges pieces are assembled, remove rust resistant coating from machined surfaces, clean gaskets and smooth all burrs and other defects. Make up flanged joints tight, care being taken to prevent undue strain upon valves or other pieces of equipment.

3.02 TESTING

A. Test all pipelines for water/gas tightness as specified in the piping or system sections. Furnish all labor, testing plugs or caps, pressure pumps, pipe connections, gauges and all other equipment required. Testing shall be performed in accordance with one or more of the testing procedures appended to this Section as specified in each piping or system sections. All testing shall be performed in the presence of the ENGINEER.

B. Repair faulty joints or remove defective pipe and fittings and replace as approved by the ENGINEER and retest.

END OF SECTION 15120

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SECTION 15140

DOMESTIC WATER PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The CONTRACTOR shall furnish and install domestic water pipe, fittings, valves, accessories, specialties as shown, specified or required for a complete installation and satisfactory operation. Provide pipe and fittings of new materials, protected from dirt, moisture, and mechanical damage.

B. Work covered under this Section primarily pertains to the operations building and emergency eye washes and showers around the site.

1.02 REFERENCES

A. ASSE 1010 - Water Hammer Arresters

B. ASSE 1011 - Hose Connection Vacuum Breakers

C. ASSE 1012 - Backflow Preventers with Immediate Atmospheric Vent

D. ASSE 1013 - Backflow Preventers, Reduced Pressure Principle

E. AWWA C510 - Double Check Valve Backflow Prevention Assembly

F. AWWA C511 - Reduced Pressure Principle Backflow Prevention Assembly

G. PD1WH201 - Water Hammer Arresters

H. ASTM B42 - Seamless Copper Pipe

I. ASTM B88 - Seamless Copper Water Tube

J. ASTM B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings

K. ASTM B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings

L. FBC - 2015 Plumbing & Fuel Gas Code

1.03 SUBMITTALS

A. Provide submittals, including the following, in conformity with Section 01300.

B. Product Data and Information: Provide data on pipe materials, pipe fittings, valves and accessories. Provide MANUFACTURERs catalog information and indicate valve data and ratings.

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C. Shop Drawings: Provide shop drawings showing the following:
   1. Layout of pipes, fittings, supports, valves and equipment.
   2. Sections showing elevations of pipes, fittings, supports, valves and equipment.
   3. Pipe size, type, material and schedule.

D. Operation and Maintenance Manuals: Submit operation and maintenance manuals for the valves, gauges, and thermometers as specified in Section 01730.

1.04 QUALITY ASSURANCE AND QUALIFICATIONS

A. The work shall be completed by a certified plumbing contractor as defined by Florida Department of Business and Professional Regulation.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle all products and materials as specified in Division 1 and as follows:
   1. Accept valves and specialties on site in shipping containers with labeling in place. Inspect valves for damage.
   2. Provide temporary protective coating on cast-iron and steel valves.
   3. Provide temporary end caps and closures on piping and fittings. Maintain end caps in place until installation.
   4. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

1.06 SPARE PARTS

A. Provide test kits for each backflow preventer furnished by the backflow preventer MANUFACTURER.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. The following Manufacturers are acceptable.

B. Gate Valves
   1. Nibco F-607-OTS
   2. Stockham
   3. Kennedy, Division of ITT Grinnell Co., Inc.

C. Check Valves
   1. Nibco F-908-W
   2. Stockham
   3. Crane

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D. Ball Valves
1. Nibco - Model T-585-70
2. Stockham - Model S-216BR-R-T
3. Crane - Model 9302

E. Shock Absorbers
1. Josam - "Absorbatron"
2. Wade
3. Zurn
4. J.R. Smith

F. Backflow Preventers (RPZ type)
1. Watts Regulator Co. - Series 909
2. Wilkins
3. Cla-Val

G. Pipe Sleeves
1. Thunderline Corp. - "Link Seal "Model WS".
2. or equal

H. Gauges
1. Ametek Co.
2. Marsh Co.

I. Thermometers
1. Ametek Co.
2. Marsh Co.

J. Trap Primer
1. Precision Plumbing Products
2. Smith
3. Wade

2.02 MATERIALS

A. Copper Pipe and Fittings
1. Provide Type L seamless, round, hard drawn copper tubing that meets ASTM B88 requirements for above ground installation. Provide Type K seamless, round, hard drawn copper tubing that meets ASTM B88 requirements for below ground installation. Provide tube sizes, dimensions and wall thickness conforming to ASTM B88. Provide nominal lengths of hard copper tubing in straight lengths of approximately 20 feet, unless otherwise specified.
a. Fittings: For copper tubing, use solder joint or flared end type fittings, as specified. No bending of hard copper tubing will be permitted, unless otherwise specified; make all bends and connections with suitable fittings.
1) Provide flared tube fittings meeting the requirements of the SAE Hydraulic Tube Fittings standard. After flaring, anneal the

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joints before assembly. Flared fittings shall be of brass half-hard bar stock, ASTM B 16 (SAE 72) or of brass forgings, ASTM B 124, Alloy Number 2 (SAE 88). Assemble couplings and fittings to prevent overstressing the tubing. Where required, use anti-seize lubricating compound to prevent galling and to facilitate assembly.

2) Solder Joint Fittings: Provide ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and copper alloy fittings. Braze solder joint fittings and tubing in conformity with the specifications of Section 3 of the CABRA Copper Tube Handbook. Brazing alloy shall be copper-phosphorus alloy, Class BCuP-5, as specified by American Welding Society Spec. AWS A5.8.

b. Joints: Provide ASTM B32 lead-free soldered joints.

2. Solder: Use ASTM B32 alloy Grade 95TA (95 percent tin and 5 percent antimony).

B. Valves:

1. Provide valves recommended by their MANUFACTURER for the conditions of use as installed, and capable of tight shutoff under those conditions. Provide valves recommended for a fluid operating temperature up to 250 degrees F.
2. Provide valves in insulated pipes with an extended neck to clear the insulation.
3. Provide combination temperature and pressure relief valves at the domestic water heaters meeting the requirements of the ASME pressure temperature rating.
4. Provide a chromium-plated stop valve with handwheel at an accessible location on each water connection at each plumbing fixture.
5. Provide screwed pattern and soldered pattern valves with unions to facilitate removal from the pipe.
6. Provide accessible pressure rated 3/4-inch hose-end gate valves at low points for draining each water piping system.
7. Ball Valves: Provide a screwed pattern 2-piece brass or bronze ball valve rated at 125 psi minimum, precision ground, free floating ball, stem shoulder preventing blowout, reinforced teflon stem seals and seats, and a rustproof handle with stop clearing the pipe insulation.

C. Shock Absorbers: Provide each shock absorber meeting the requirements and be sized no smaller than recommended by Plumbing and Drainage Institute "Standard WH201" as ASSE Standard 1010. Isolate each absorber from the piping system by a ball valve, locate accessible for service, and prevent "water hammer" by absorbing surge pressures created by the quick-closing valve(s). Construct absorber of stainless steel or other material which is nonrusting, and include a wetted bellows contained in a pressurized chamber and rated for 150 psi working pressure.

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D. Escutcheons: Provide chrome nickel-plated brass escutcheons, sized to fit over the pipe and its insulation, at locations where exposed pipes penetrate finished surfaces.

E. Backflow Preventers: Provide backflow preventers of the reduced pressure type as shown on the Drawings.
   1. Construct all moving parts and trim of corrosion-resistant materials with neoprene valve discs.
   2. Provide each backflow preventer assembly complete with gate valves at both inlet and outlet sides.
   3. Provide backflow preventers suitable for a maximum working pressure of 175 psi, and water temperatures from 32 to 145 degrees F.

F. Gauges: Provide pressure gauge(s) that is 4-inch diameter, and of bourdon tube type with aluminum black flange case, with an accuracy of one percent within scale range and constructed of materials impervious to the fluid measured.
   1. Model Ametek P5105.
   2. Provide the type such that the standard dial range installed is standard range double normal operating pressure with graduations not exceeding one percent of range or one psi maximum.
   3. Install, at each gauge connection, a 1/4-inch brass tee handle gauge cock and a pressure variation snubber.
   4. Where gauges are required at pumps, pipe connections from the pump suction and discharge through gauge cocks to pressure gauge so that either pump suction or pump discharge pressure may be read, unless otherwise specified.
   5. Position gauges to be easily read from a normal standing position, and provide inclined or adjustable type where required.
   6. Provide gauges at each building incoming service.

G. Thermometers: Provide bimetal 3-inch diameter dial thermometer or 9-inch scale red reading industrial type with fumeproof stainless steel or cast case and glass face with 6-inch stem and 2-1/2-inch extension neck separable well.
   1. Provide Model Ametek 6320.
   2. Provide thermometer range of approximately 50 to 250 degrees F in 2 degrees F increments for hot water lines, and approximately 0 to 100 degrees for cold water lines unless otherwise specified.
   3. Provide accuracy within one percent over the entire scale range.
   4. Position thermometers to be easily read from a normal standing position, and provide thermometers of the inclined or adjustable type where required.
   5. Provide thermometers at water heater inlet and outlet connections.

H. Drip Pans: Install polished, 16-ounce reinforced copper drip pans under all pipes that pass over or near electrical control equipment as shown.
   1. Provide drip pans with suitable connections to the drainage system.

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I. Drain Valves: Provide each cold water, hot water and circulating water piping system with 3/4-inch globe valves with vacuum breaker hose adapters, accessibly located at piping low points for completely draining the system.
   1. Provide Stockham Model B-13T.

J. Lab Filter system – reverse osmosis (RO) and deionization (DI) System
   1. Package includes the following filters.
      Stage 1: 5 Micron Pre-Filter
      Stage 2: Carbon Block Filter
      Stage 3: Chloramine Carbon Filter
      Stage 4: 50 to 150 GPD TFC RO Membrane
      Stage 5: DI Cartridge
      Stage 6: Second DI Cartridge

   2. Package includes the following components
      Digital Commercial Conductivity Monitor
      Storage Tank – 4.5 gallon

   3. Manufacturer – US Water System
      Model – Aquapurion RO-DI System
      Capacity – 50 to 150 gallon per day (GPD)

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Install water piping specialties in accordance with the MANUFACTURERs recommendations and approved show drawings and as specified in Division 1.

B. Piping Installation: Install domestic water piping clear of all building elements.
   1. Review elevations before proceeding with the Work, and the location, depth and size of sewers before connections are made.
   2. Pitch horizontal water pipes to facilitate draining through drain hose valves installed at low points.

C. Shock Absorbers: Install shock absorbers on each water pipe supplying solenoid valves or other automatic or manual quick-closing valves.

D. Air Chambers: Provide air chambers in water piping at the top of upfeed risers, and in branch pipes at plumbing fixtures and other water appliances.
   1. Install air chambers in a direct line with the flow of water through such pipes of sufficient capacity to provide an air cushion which will absorb shock, stress or strain caused by the operation of valves or faucets in the water supply system.

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2. Provide air chambers constructed of the same pipe to which they are connected and not less than 18 inches in length, except for air chambers on each water supply branch connection to individual plumbing fixtures which is not less than 12 inches in length.

E. Backflow Preventers: Install backflow preventers where shown and where necessary to prevent contamination of the cold water supply caused by possible cross-connection with a contaminated source. Pipe the relief valve vent to discharge over the nearest floor drain or to outside the Building.

F. Pipe Expansion Provisions: Connect, support and guide piping to permit and control pipe expansion and contraction and to accommodate building expansion, contraction and settling without damage.
1. Provide piping expansion loops or expansion joints sized to accommodate possible expansion without exceeding allowable pipe and fitting stresses in straight sections of hot water piping more than 50 feet in length. Locate expansion devices midway between anchor points, and the pipes guided as recommended.
2. Provide anchors for piping within a structure consisting of welded plates, angles, channels, or beams braced and securely fastened to the pipe and to structural members adequate to safely withstand resulting stresses.

G. Pipe Sleeves: Provide steel pipe sleeves for pipes piercing concrete and masonry construction. Install pipe sleeves with welded water stop plates in floors, exterior walls and foundation walls.
1. Seal watertight insulated and uninsulated lines installed in the pipe sleeves with an elastic mechanical pipe sleeve seal of size and service designation as recommended by the MANUFACTURER for proper sealing.
2. Furnish appropriate fire-rated sleeve seal and insulated pipe protectors for fired rated walls and floors.

H. Pipe and Valve Identification: Identify all pipelines and valves in accordance with Specification 15076.

I. Hangers and Supports: Provide hangers and supports as specified in Section 15060.

3.02 FIELD QUALITY CONTROL

A. MANUFACTURER's Field Services: Furnish the services of a qualified representative of the MANUFACTURER to provide instruction on proper installation of the equipment, testing of the equipment and place the equipment in trouble-free operation.

B. Tests: After installation of the piping, control equipment and all appurtenances, subject each unit to a field running test.

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1. Apply a water pressure test to all parts of the domestic water system before the piping is concealed and before the fixtures and equipment are connected. Use a hydrostatic pressure of not less than 100 psig or 150% of system operating pressure, applied to the system for a period of 4 hours. There shall be no leaks at any point in the system at this pressure.

C. Disinfection: Disinfect pipelines that convey potable water in accordance with the requirements of Section 15141.

END OF SECTION 15140

SECTION 15141

DISINFECTION

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Disinfection of all pipelines, conduits, pumps, tanks, structures, and equipment which are to store, handle or carry potable water. All labor, chlorine and equipment, including taps, corporation stops, temporary pumps, hoses, miscellaneous piping and other items necessary to perform the work, shall be furnished and installed by the CONTRACTOR, and removed after completion of the disinfection procedure.

1.02 REFERENCES

A. AWWA C651- Disinfecting Water Mains

B. AWWA C652- Disinfection of Water-Storage Facilities

C. Florida Building Code, Plumbing (Latest Edition)

1.02 QUALITY ASSURANCE

A. Disinfection shall be in accordance with AWWA C651 for water mains and AWWA C652 for water storage facilities and equipment, except as modified herein. Disinfection procedures for new water mains and water storage facilities shall also conform to the requirements of the International Plumbing Code, Section 610 “Disinfection of Potable Water System” except as modified herein.

PART 2 – PRODUCTS

(NOT USED)

PART 3 – EXECUTION

3.01 PIPELINES

A. Pumps, hydrants, and other water handling equipment items that are part of the potable water distribution system shall be disinfected in the same manner as described herein for the pipelines.

B. Pipelines shall first be flushed with clean water. Disinfection shall be accomplished by the Continuous Feed Method, as specified in AWWA C651, using sodium hypochlorite solution.

C. Water-chlorine solution with a concentration not less than 50 mg/l of available chlorine shall then be added at one end of the section being disinfected and discharged at the

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far end. The water-chlorine solution shall be added until the water coming from each downstream blowoff has a residual of not less than 25 mg/l of chlorine.

D. The pipelines shall then be closed and the solution allowed to remain in the lines for at least 24 hours. The chlorine residual in the pipeline shall then be rechecked. If the free chlorine residual is less than 10 mg/l after 24 hours, the procedure shall be repeated until the free chlorine residual after 24 hours is 10 mg/l or greater.

E. After the 24-hour holding period, the pipelines and equipment shall be thoroughly flushed and filled with clean water. Flushing water shall not be permitted to enter existing water mains.

F. Flushing water shall not be discharged to sanitary or storm sewers without permission of local authority. Where necessary, Federal, State and local regulatory agencies shall be contacted to determine special provisions for the disposal of heavily chlorinated water.

G. When new potable water pipelines are to be connected to an existing water distribution system, the connecting piping shall be disinfected and tested in accordance with the procedure set forth in Section 9.1 or Section 9.2, as applicable, of AWWA C651.

3.02 WATER SUPPLY

A. The CONTRACTOR shall provide all necessary apparatus to convey the water to the point of use and perform the disinfection procedure.

3.03 VEREIFICATION OF DISINFECTION

A. After the completion of disinfection, bacteriological samples shall be taken by the CONTRACTOR and tested at a certified laboratory. Samples shall be taken as required by the FDEP. The test reports shall be submitted to the ENGINEER for review and approval. If the samples are not satisfactory, the entire disinfection procedure shall be repeated at the expense of the CONTRACTOR until satisfactory samples are obtained.

END OF SECTION 15141

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SECTION 15150

SANITARY WASTE AND VENT PIPING

PART 1- GENERAL

1.01 SECTION INCLUDES

A. This Section includes furnishing and installing sanitary waste and vent pipe, fittings, accessories, specialties as shown, specified, or required for a complete installation and satisfactory operation. Provide pipe and fittings of new materials, protected from dirt, moisture and mechanical damage.

1.02 RELATED SPECIFICATIONS

A. Specification 15060 - Hangers and Supports

B. Specification 15076 - Piping and Equipment Identification

C. Specification 15410 - Plumbing Fixtures and Equipment

1.03 REFERENCES

A. ASME A112.1 - Floor Drains

B. Florida Building Code, Plumbing (latest edition)

1.04 SUBMITTALS

A. General: Provide submittals, including the following, in conformity with Section 01300.

B. Product Data and Information: Provide data on pipe materials, pipe fittings, and accessories.

C. Shop Drawings: Provide shop drawings showing the following:
   1. Layout of pipes, fittings, supports, and equipment.
   2. Sections showing elevations of pipes, fittings, supports, valves and equipment.
   3. Pipe size, type, material, and schedule.

1.05 QUALITY ASSURANCE AND QUALIFICATIONS

A. The work shall be completed by a certified licensed plumbing contractor as defined by Florida Department of Business and Professional Regulation.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle all products and materials as specified in Division 1 and as follows:
   1. Provide temporary end caps and closures on piping and fittings. Maintain end caps in place until installation.
   2. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

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1.07 SPART PARTS, TOOLS, AND SUPPLIES

A. Provide 3 sets of all special access tee wrenches or keys for removal of cleanout covers.

PART 2- PRODUCTS

2.01 MANUFACTURERS

A. The following manufacturers are acceptable. Equivalent products of other manufacturers may be submitted for approval.

B. Floor Drains
1. J. R. Smith Mfg. Co.
2. Josam Co.
3. Wade Division/Tyler Pipe
4. Zurn

C. Cleanouts
1. J. R. Smith Mfg. Co.
2. Josam
3. Wade Division/Tyler Pipe
4. Zurn

D. Pipe Sleeves
1. Thunderline Corp. - "Link Seal "Model WS".
2. or approved equal

E. PVC - Pipe and Fittings
1. Charlotte Pipe and Foundry Company
2. or approved equal

F. Acid Waste Pipe and Fittings
1. Orion (a Watts Brand)
2. or approved equal

2.02 PVC - PIPE AND FITTINGS

A. Pipe and fittings shall be manufactured from virgin rigid PVC (polyvinyl chloride) vinyl compounds with a cell class of 12454 as identified in ASTM D 1784.

B. PVC Schedule 40 pipe shall be Iron Pipe Size (IPS) conforming to ASTM D 1785. Injection molded PVC Schedule 40 fittings shall conform to ASTM D 2466. Pipe and fittings shall be manufactured as a system and be the product of one manufacturer.

C. Fittings shall be the socket type for solvent welded joints as designated in ASTM D-2466, and shall be compatible with the pipe where installed.

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D. Caulking for plastic pipe in wall sleeve shall be by a mechanical, modular, rubber sealing element placed in between the sleeve and pipe and expanded to make a tight fit or other method approved by the ENGINEER.

E. Expansion joints shall have integral duck and rubber flanges. They shall have individual solid steel ring reinforcement with a carcass of highest grade woven cotton or acceptable synthetic fiber. Joints shall be constructed of pipeline size and to meet working pressure and corrosive conditions similar to the line where installed. They shall be of a filled arch-type construction with a minimum of three arches per joint. All joints must be finish-coated with Hypalon paint to prevent ozone attack. They shall be Style 500 as manufactured by Mercer Rubber Co. of Trenton, New Jersey, or equal.

2.03 ACID WASTE - PIPE AND FITTINGS

A. Acid waste shall drain through polypropylene, schedule 40 pipe. The pipe shall be manufactured to the dimensions and tolerances of ASTM F1412. Pipe shall be cylindrical, straight and factory grooved. The polypropylene material shall conform to ASTM D4101.

B. The fittings shall be manufactured to schedule 40 dimensions per ASTM F1412 and shall be made of fire retardant polypropylene, per ASTM D4101. Fitting layout shall conform to ASTM D3311 and F1412.

C. Pipe and fittings shall be joined using a no-hub method, utilizing all plain end factory grooved fittings joined with no hub couplings. The couplings shall have an outer band of 300 stainless steel with 5/16-inch bolts, nuts, and washers plated to meet a 100 hour salt spray test per ASTM B117. The no hub joint will conform to the requirements of ASTM F1412.

2.04 EQUIPMENT

A. Floor Drains: Provide floor drains where shown and as required by code. Provide deep seal p-traps for all floor drains.
   1. FD-1, Floor Drain (finished Areas and showers)
      a. Materials: Cast-iron body, adjustable nickel bronze strainer.
      b. Manufacturer and Product: Jay R. Smith Mfg. Co.; Model 2005; with round or square top
      c. Options - trap primer connection, vandal proof screws.
   2. Funnel Assembly
      a. Materials: Cast-iron body
      b. Manufacturer and Product: Jay R. Smith Mfg. Co.; Model 3580

B. Escutcheons: Provide chrome nickel-plated brass escutcheons, sized to fit over the pipe and its insulation, at locations where exposed pipes penetrate finished surfaces.

C. Cleanouts: Provide cleanouts meeting the following requirements.
   3. Floor Cleanouts in Finished Rooms: Provide floor cleanouts in finished rooms with an adjustable cast-iron floor cleanout installed flush with finished floor, with cutoff sections, brass internal plug, satin finish nickel alloy top, and with secured cover.

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a. J.R. Smith Mfg. Co., Figure No. 4429.

2. Floor Cleanouts in Unfinished Rooms: Provide floor cleanouts in unfinished rooms with a satin finish brass top, and secured heavy-duty brass cover.
   a. J.R. Smith Mfg. Co., Figure No. 4221-S
3. Cleanouts on Exposed Piping: On exposed risers and horizontal piping provide cleanouts with cast-brass, with countersunk, iron pipe size male threaded plug.
4. Cleanouts on Concealed Piping: On concealed piping provide cleanouts with cast-brass, countersunk, with stainless steel round access cover plate secured to plug with countersunk screw.
   a. J.R. Smith Mfg. Co., Figure No. 4531-S

D. Drip Pans: Install polished, 16-ounce reinforced copper drip pans under all pipes that pass over or near electrical control equipment.
   1. Provide drip pans with suitable connections to the drainage system.

E. Vent Flashing:
   1. Furnish 16 lead flashing, material as recommended by roofing system manufacturer, or copper pitch pans for all vents through the roof. Type of flashing used shall be compatible with piping material.

PART 3- EXECUTION

3.01 INSTALLATION

A. Piping Installation: Install plumbing piping clear of all building elements.
   1. Pitch drain-line piping uniformly downward in the direction of flow not less than 1/8-inch per lineal foot.
   2. Review elevations before proceeding with the Work, and the location, depth and size of sewers before connections are made.
   3. Before running any drains and sewers within buildings, or any vent or drain stacks, or any water lines, verify that they can be run without trapping, sagging or interfering with columns, beams, piping, fixtures, ducts, or other system components. Coordinate necessary changes before pipes are installed.
   4. Flash pipes passing through the roof watertight with 4-pound per square foot sheet lead, except as otherwise shown. Extend flashing out on the roof not less than 18 inches from the pipe or edge of drain in all directions, and turn down into vent pipes.

B. Cleanouts: Provide cleanouts at ends of mains, each change in direction of more than 45 degrees, spaced not more than 50 feet apart in all straight runs, and at the base of all soil stacks, downspouts, and fixture traps. Terminate cleanouts for concealed pipes flush with finish floor, wall or grade with trim as specified. Provide cleanouts of the same size as the pipe up to 4 inches in diameter, and 4-inch size for larger pipes and located for convenient access.

C. Pipe Sleeves: Provide steel pipe sleeves for pipes piercing concrete and masonry construction. Install pipe sleeves with welded water stop plates in floors, exterior walls and foundation walls.

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1. Seal watertight insulated and uninsulated lines installed in the pipe sleeves with an elastic mechanical pipe sleeve seal of size and service designation as recommended by the manufacturer for proper sealing.
2. Furnish appropriate fire-rated sleeve seal and insulated pipe protectors for fired rated walls and floors.

D. Pipe Identification: Identify all pipelines in accordance with Specification 15076.

E. Hangers and Supports: Provide hangers and supports as specified in Specification 15060.

3.02 INSPECTION AND TESTING

A. All pipelines shall remain undisturbed for 24 hours to develop complete strength at all joints. All pipelines shall be subjected to a hydrostatic pressure test for 2 hours at full working pressure. All leaks shall be repaired and lines retested as approved by the ENGINEER. Prior to testing, the pipelines shall be supported in an approved manner to prevent movement during tests.

B. The test pressures and temperatures for the various pipe lines shall be as follows. Pipe shall be pressure tested with water. Pressure testing with air or gas is not permitted.
1. Drain piping: 15 psi at ambient temperature
2. Vent piping: 15 psi at ambient temperature

3.03 PAINTING

A. Field painting of piping shall be in accordance with Section 09900.

END OF SECTION 15150

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SECTION 15410

PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The CONTRACTOR shall furnish, install, test and place in satisfactory operation all plumbing fixtures as specified herein, and as shown on the Contract Drawings.

B. Plumbing fixtures shall be furnished complete with all accessories, attachments, fastenings and other appurtenances as specified or as may be required for a satisfactory installation.

1.02 RELATED SPECIFICATIONS

A. Specification 15141 – Disinfection

1.03 REFERENCES

A. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use.

B. ASME A112.18.1M - Plumbing Fixture Fittings.

C. ASME A112.19.1M - Enameled Cast Iron Plumbing Fixtures.

D. ASME A112.19.2M - Vitreous China Plumbing Fixtures.

E. ANSI A112.19.5 - Trim for Water-Closet Bowls, Tanks, and Urinals (Dimensional Standards).

F. ANSI Z358.1 - Emergency Eyewash and Shower Equipment.

G. ANSI/ARI 1010 - Drinking-Fountains and Self-Contained, Mechanically-Refrigerated Drinking-Water Coolers.

H. ANSI/CABO A117.1 - Accessible and Usable Buildings and Facilities.

I. U.S. Department of Commerce Commercial Standard.

J. Florida Building Code, Plumbing.

1.04 DESIGN REQUIREMENTS

A. Plumbing fixtures shall be of the water conservation type and shall conform to the requirements of the local Code.

B. Contract Drawings are generally diagrammatic and installation of the plumbing fixtures in the allotted spaces shall be verified.

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1.05 SUBMITTALS

A. The CONTRACTOR shall submit shop drawings and material specifications for the approval of the ENGINEER in accordance with Section 01300.

B. Manufacturer’s technical information which shall include:
   1. Product Data and Information: Provide catalogue cuts of all plumbing fixtures, sizes, rough-in dimensions, utility sizes, faucets, drains, carriers, flush valves, trim and finishes, and all electrical requirements. Complete assembly, layout required clearances and installation drawings with clearly marked dimensions. Provide a list of manufacturer's recommended special tools and spare parts to be supplied.
   2. Operation and Maintenance Manuals: Submit operation and maintenance manuals in accordance with Section 01730 for plumbing fixtures, faucets, drains, mixing valves, flush valves, carriers, assembly of parts list for flush valves, signage, emergency equipment and electric water coolers as required.

1.06 QUALITY ASSURANCE AND QUALIFICATIONS

A. The CONTRACTOR shall be a licensed plumber in the state of Florida.

B. All plumbing fixtures shall be "First Quality" as defined and set forth in Commercial Standard CS77-28 as promulgated by the U.S. Department of Commerce. All fixtures are to be white vitreous china unless otherwise specifically noted. Where enameled iron fixtures are specified, they shall be furnished with acid resisting enamel.

C. Plumbing fixtures shall essentially be as efficient as those fixtures that have been tested to perform satisfactorily for at least two years.

D. Fixtures shall be properly protected from damage during construction and shall be cleaned in accordance with manufacturer's instructions.

E. Fixtures and fittings proposed shall be from one manufacturer and of similar character in any room or location. Escutcheons, handles, etc., on the different fixtures shall be of the same design.

F. All plumbing fixtures and other related materials shall be inspected for chips, cracks, dents and other flaws. Only items free from defects shall be installed in the work. All fixtures shall be furnished with all necessary supports, hangers, brackets, etc., for the proper installation of the fixtures. Such supports, etc., shall be in accordance with the manufacturer's recommendations.

G. All wall hung fixtures shall be adequately supported from floor with fixture support carriers independent from walls, and floor mounted fixtures shall be secured to concrete slabs with lead expansion inserts.

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1.07 DELIVERY, STORAGE AND HANDLING

A. The CONTRACTOR shall deliver the plumbing fixtures and appurtenances to the site in the original sealed packing crate. All products shall be protected from chips, scratches or any damage. Any product damaged shall be replaced at no additional cost to the OWNER. The fixtures will be inspected for damages. Fixtures gouged, chipped or otherwise damaged will not be considered acceptable.

B. The CONTRACTOR shall be responsible for securing storage until final acceptance. The OWNER will not be responsible for any products lost or stolen. Plumbing fixtures shall be stored on heavy wood blocking or platforms so that they are not in contact with the ground.

C. To avoid unnecessary handling, plumbing fixtures shall be unloaded as close to the place where they are to be installed as is practical. Interiors shall be kept free from dirt and foreign matter.

1.08 JOB CONDITIONS

A. Protection: At the end of each days' Work or other stopping point throughout the construction, CONTRACTOR shall provide temporary covering over all plumbing fixtures and trim as required to prevent damage due to moisture, dirt, plaster, concrete or other material. Chipped, cracked, dented or damaged fixtures or trim will not be accepted in the finished installation.

1.09 FIELD MEASUREMENTS

A. The CONTRACTOR shall verify all dimensions and shall make any field measurements necessary and shall be fully responsible for accuracy and layout of the work.

B. The CONTRACTOR shall review the Contract Drawings and any discrepancies shall be reported to the ENGINEER for clarification prior to starting installation.

PART 2 PRODUCTS

2.01 MATERIALS

A. All plumbing fixtures provided shall be of high quality and shall be manufactured from the following materials:
   1. Vitreous china shall be non-absorbent, hard-burned, and vitrified throughout the body.
   2. Porcelain enameled ware shall have specially selected, clear white, acid-resisting enamel coating evenly applied on surfaces.
   3. Internal parts of flush and/or flushometer valves, may contain acetal resin, fluorocarbon, nylon, acrylonitrile-butadiene-styrene (ABS) or other plastic

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material, if the material has provided satisfactory service under actual commercial or industrial operating conditions for not less than 2 years. Plastic in contact with hot water shall be suitable for 180 degrees Fahrenheit water temperature.

4. No fixture will be accepted that shows cracks, blisters, thin spots, or other flaws. All fixtures shall be white and faucets shall have chrome plated flexible tube risers with loose key operated shutoff valves.

B. Fixtures shall be equipped with appurtenances such as traps, faucets, stop valves, and drain fittings. Each fixture and piece of equipment requiring connections to the drainage system shall be equipped with a trap. All exposed traps shall be cast brass swivel chromium plated, grounded joint, and with cleanout.

C. Brass expansion or toggle bolts capped with acorn nuts shall be provided for supports, and polished chromium-plated pipe, valves, and fittings shall be provided where exposed to view.

D. Plumbing fixtures shall be as indicated in the Plumbing Fixture Schedule on the Contract Drawings.

2.02 FIXTURES

A. Water Closets:
   1. Item No. WC:
      a. Manufacturer: American Standard, Kohler, or approved equal
      b. Type: Floor mounted, bottom outlet
      c. Features:
         1) Elongated bowl.
         2) Flush Valve – manual
         3) ADA Compliant
      d. Materials: Vitreous China, white.
      e. Accessories:
         1) Seat, white open front

B. Lavatories:
   1. Item No. LAV:
      a. Manufacturer: American Standard, Kohler, or approved equal
      b. Type: Wall hung lavatory.
      c. Faucet holes: 4” centers
      d. Materials: Vitreous China, white.
      e. Features:
         1) Self-draining deck
         2) Front overflow.
         3) Concealed arm support
      f. Faucet: Deck mounted mixing faucet, 4” fixed center, 4” lever handle and 4” brass sprout.
      g. Carrier: Jay R. Smith Mfg. Co.; Model 0800, commercial type.

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h. Accessories:
1) Trap, “P” trap with cleanout, slip joint inlet, 17 gauge tubing, 1-1/4 inch by 1-1/2 inch outlet, chrome finish.
2) Brass grid strainer
3) Stop Valve: ¼ turn ball valve, lead free, brass construction and chrome plating. Acceptable manufacturers are Brasscraft KT series; Mcguire Manufacturing LFBV series; Keeney Manufacturing PCLF series.

C. Mop Sinks:
1. Item No. MS:
a. Manufacturer: American Standard, Kohler, or approved equal
b. Type: wall mounted, enameled cast iron sink.
c. Carrier: Jay R. Smith Mfg. Co.; Model 0871
d. Accessories:
1) Faucet with vacuum breaker
2) Trap shall be equal to Kohler, Model No. K-6673-NA acid resisting enamel trap with cleanout plug and strainer.

D. Urinal (UR):
1. Manufacturer: American Standard, Kohler, or approved equal
a. Fixture: Vitreous china, siphon jet action, top spud, flushing rim.
b. Trim: Conventional flush valve, 1.0 gallons per flush.
c. Carrier: Jay R. Smith Mfg. Co.; Model 614, commercial type.

E. Safety Equipment:
1. Safety Shower/Eyewash Combination (EES):
a. Shower: Stainless steel deluge.
b. Eyewash: Stainless steel aerated eye/face wash and stainless-steel bowl.
c. Valves: Stay open.
d. Support: Freestanding, 1-1/4-inch stainless steel pipe standard, stanchion, and stainless-steel floor flange
e. Alarms: mounted strobe light.
f. Flow Switch – thermal differential mass flow switch with dual RTD sensors; constructed of 316L stainless steel; rated for 90-260 VAC at 4 watts; outputs are DPDT relay contacts at 5 amp, 250 VAC with fail safe capability; integral self-testing, that is automatic during power-up; flow rate setpoint for water at 2.5 ft per sec; sensor response time of 0.5 to 10 seconds; repeatability for flow shall be < 0.5 % of set point ±1% of span over a range of ±50 deg F. Flow switch shall be manufactured by Delta M Corporation.

F. Electric Water Coolers:
1. Item No. EWC:
a. Water cooler shall be recessed unit with a minimum capacity of 8 gallons per hour at 90□F ambient air temperature.
b. 80ºF water inlet temperature.

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c. 50ºF supply water temperature.
d. Fountain top shall be stainless steel.
e. Cabinet finish shall be stainless steel.
f. Manufacturer: Elkay, Haws, or approved equal

PART 3 EXECUTION

3.01 INSTALLATION

A. Fixtures requiring hot and cold water shall have the cold water faucet on the right hand side of the fixture and the hot water faucet on the left hand side of the fixture. Each fixture shall have shut off valves or stops for hot and cold water.

B. Each fixture shall be separately trapped.

C. Pipe openings shall be closed with caps or plugs during installation. Fixtures shall be tightly covered and protected against dirt, water, chemicals and mechanical injury.

D. Plated or polished fittings, pipes and appliances shall be coated with protective material immediately after installation.

E. Where space limitations prohibit fixture connections with standard fittings in conjunction with the cast-iron floor flange, special short-radius fittings shall be provided. Connections between earthenware fixtures and flanges on soil pipe shall be made gas-tight and water-tight with a closet-setting compound or neoprene gasket and seal. Use of natural rubber gaskets or putty will not be permitted. Fixtures with outlet flanges shall be set the proper distance from floor or wall to make a first-class joint with the closet-setting compound or gasket and fixture used.

F. Confirm location, size of fixtures and openings before installation.

G. Layout fixtures as indicated on the drawings.

H. Carefully install fixtures in accordance with manufacturer's data with sufficient clearances to coordinate with accessories, specialties and equipment specified in other divisions of these specifications and/or as shown on the drawings.

I. Hangers and carriers shall be installed in accordance with manufacturer's recommendations and in accordance with good practice and workmanship.

J. Provide one support for each water closet with all necessary hardware and gaskets, suitable for specified floor construction.

K. Upon completion of the work, all labels shall be removed, fixtures and trim shall be cleaned of all dirt, grease and markings and all valves properly adjusted.

L. Clean all exposed metal surfaces from grease, dirt, paint or other foreign material.

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M. Fixtures shall be properly protected from damage during construction and shall be cleaned in accordance with manufacturer's instructions.

N. Fixtures, chrome-plated piping, fittings and trim shall be polished before requesting acceptance of the system.

O. All exposed valves and trim shall be chrome plated.

P. The entire plumbing installation shall be in accordance with best standard practice and in conformance with the plumbing ordinances in the local Building Code.

Q. Lavatory faucets for handicapped and non-handicapped utilization shall match.

R. Insulate drain, trap, hot and cold water supply lines under handicapped lavatories.

3.02 FIXTURE HEIGHTS

A. The CONTRACTOR shall install fixtures to the heights above finished floor as indicated on the Architectural drawings, as per ADA requirements. Installation of fixtures for use by the physically handicapped shall be in accordance with ANSI/CABO A117.1.

B. Water Closet Flush Valves:
1. Standard 11 inches minimum above bowl rim.
2. Handicapped 27 inches from finished floor.

C. Urinal Flush Valve:
1. Standard 22 inches to top of bowl rim.
2. Handicapped 44 inches from finished floor.

3.03 ADJUSTING

A. Upon completion of the installation, the CONTRACTOR shall adjust all fixtures for their intended use.

B. The CONTRACTOR shall operate each fixture to ensure their performance without splashing, noise or overflow.

3.04 CLEANING

A. The CONTRACTOR shall thoroughly clean all surfaces of the installed fixtures and polish all chromed surfaces.

B. Fixtures shall be protected and use of fixtures will not be permitted until permission is given by the ENGINEER.

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3.05 PROTECTION OF FINISHED WORK

A. Protect finished Work as specified in Division 1.

B. Fixture Use: Do not permit use of fixtures prior to being accepted by the OWNER.

3.06 SUPPORT TESTING

A. All wall hung fixtures shall have a sand bag load placed on the fixture in accordance with the testing schedule below and shall not exhibit any downward deflection.

Testing Schedule	
Fixture	Load
Water Closet	250 lbs
Lavatory	150 lbs
Service Sink Faucet	50 lbs
Urinal	150 lbs
Electric Water Cooler	50 lbs

3.07 INTERFACE WITH OTHER PRODUCTS

A. Review millwork shop drawings. Confirm the location and size of fixtures and openings before rough-in and installation.

3.08 SAFETY EQUIPMENT:

1. System Shutoff Valves:
   a. Shutoff valves shall give visual indication of position (open or closed).
   b. Shutoff valves shall be lockable valves and locked in open position.
2. Each safety shower, eyewash, combination safety shower/eyewash shall have red safety signoff tag. After completing requirements listed below, CONTRACTOR shall sign red safety signoff tag. Requirements are as follows:
   a. Visually check safety shower/eyewash piping for leaks.
   b. Verify that upon operation, stay-open valves remain open.
   c. Showerheads to be between 82 inches and 96 inches above standing surface.
   d. Shower spray pattern, when valve is full open, shall be a minimum 20 inches in diameter at 60 inches above standing surface.
   e. Water arcs from eyewash spray heads must cross. Test with eyewash gauge.
   f. Minimum flow rates for safety showers shall be 20 gpm.
   g. Minimum flow rates for eyewashes shall be 3 gpm.
3. Shower base plate shall be anchored to floor slab.

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SECTION 15410

PLUMBING FIXTURES

END OF SECTION 15410

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SECTION 15480

DOMESTIC WATER HEATER

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUBMITTALS

A. Submit product data for each type and size of domestic-water heater indicated in accordance with Section 01300.
   1. Submit wiring diagrams for power, signal and control wiring.
   2. Retain first paragraph below and "ASHRAE/IESNA 90.1 Compliance" Paragraph in "Quality Assurance" Article if required for electric, domestic-water heaters.
   3. Retain first paragraph below if required by seismic criteria applicable to Project. Coordinate with Sections specifying mechanical vibration, supports, and seismic controls. See ASCE/SEI 7 for certification requirements for equipment and components.
   4. Retain first paragraph below for product certificates from manufacturers.
   5. Product Certificates: For each type of tankless, electric, domestic-water heater, from manufacturer.
   6. Retain first paragraph below if plumbing codes for Project area require domestic-water heaters to be independent-testing-agency certified. Verify availability for units retained.
   7. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.

B. Source quality-control reports.

C. Field quality-control reports.

D. Warranty: Sample of special warranty.

E. Operation and Maintenance Data in accordance with Section 01730 for electric, domestic-water heaters.

1.03 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

C. ASME Compliance: Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 Annex G, "Drinking Water System Components - Health Effects."

1.04 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.01 WATER HEATER

A. Electric, Domestic-Water Heater
   1. Storage-Tank Construction: Steel.
      a. Tappings: ASME B1.20.1 pipe thread.
      b. Pressure Rating: 150 psig.
      c. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending lining material into tappings.
   2. Factory-Installed Storage-Tank Appurtenances:
      a. Anode Rod: Replaceable magnesium.
      b. Dip Tube: Required unless cold-water inlet is near bottom of tank.
      c. Drain Valve: ASSE 1005.
      d. Insulation: Comply with ASHRAE 90.2.
      e. Jacket: Steel, cylindrical, with enameled finish.
      f. Heat-Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.
      g. Heating Elements: Two; electric, screw-in immersion type; wired for non-simultaneous operation unless otherwise indicated. Limited to 12 kW total.
      h. Temperature Control: Adjustable thermostat.
      i. Safety Control: High-temperature-limit cutoff device or system.
      j. Relief Valve: ASME rated and stamped for combination temperature-and-pressure relief valves. Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valve with sensing element that extends into storage tank.

2.02 DOMESTIC-WATER HEATER ACCESSORIES

A. Domestic-Water Compression Tanks:

1. Description: Steel pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air pre-charge to minimum system-operating pressure at tank.
2. Construction:
   a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
   b. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
   c. Air-Charging Valve: Factory installed.
3. Capacity and Characteristics:
   a. Working-Pressure Rating: 100 psig.
   b. Capacity Acceptable: 4 gal.
   c. Air Precharge Pressure: as required.

B. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1.

C. Heat-Trap Fittings: ASHRAE 90.2.

D. Combination Temperature-and-Pressure Relief Valves: ASME rated and stamped. Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.

E. Pressure Relief Valves: ASME rated and stamped. Include pressure setting less than domestic-water heater working-pressure rating.

F. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4.

PART 3 - EXECUTION

3.01 DOMESTIC-WATER HEATER INSTALLATION

A. Install domestic-water heaters on the floor.
1. Maintain manufacturer's recommended clearances.
2. Arrange units so controls and devices that require servicing are accessible.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.
5. Anchor domestic-water heaters to substrate.

B. Install electric, domestic-water heaters level and plumb, according to the layout drawings, original design, and referenced standards. Maintain manufacturer's

recommended clearances. Arrange units so controls and devices needing service are accessible.

1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping.

C. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

D. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for electric, domestic-water heaters that do not have tank drains.

E. Install thermometers on inlet and outlet piping of domestic-water heaters.

F. Install piping-type heat traps on inlet and outlet piping of electric, domestic-water heater storage tanks without integral or fitting-type heat traps.

G. Fill electric, domestic-water heaters with water.

H. Charge domestic-water compression tanks with air.

3.02 CONNECTIONS

A. Where installing piping adjacent to electric, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.03 FIELD QUALITY CONTROL

A. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
   2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
   3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
   4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

END OF SECTION 15480

SPECIFICATION 15506

REFRIGERANT PIPING SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The CONTRACTOR shall furnish, install, test and place into satisfactory operation all refrigerant piping systems including all pipe, valves, accessories and supports required as shown on the Contract Drawings and specified herein.

1.02 RELATED SPECIFICATIONS

A. Specification 09900 - Painting

B. Specification 03300 - Cast-In-Place Concrete

C. Specification 15060 - Hangers and Supports - HVAC

D. Specification 15076 - Piping and Equipment Identification

E. Specification 15081 - Piping Insulation

1.03 REFERENCES

A. Equipment shall comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

1. American Society of Mechanical ENGINEERs (ASME).
2. American Society for Testing and Materials (ASTM).
3. American Welding Society (AWS).
4. Air Conditioning and Refrigeration Institute (ACRI).
5. National Fire Protection Association (NFPA).
6. Applicable Federal, State and local laws and/or ordinances.

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B. Where conflict arises between the local codes and the requirements of the National Electrical Code, The National Fire Code, NEMA, ASTM, etc., the more stringent requirements shall prevail.

1.04 DESIGN REQUIREMENTS

A. Drawings show the general arrangement and extent of work to be done, but the exact locations and arrangement of all parts shall be determined as the work progresses, to conform in the best possible manner with its surroundings. The exact location of all parts of the work must be governed by the general building plans and the actual building conditions. Piping, equipment, ducts, etc. found to interfere with the construction of the building, plumbing apparatus and piping, electrical wiring or other obstructions, etc. shall be located to clear such obstructions. Connections shown to the various units are intended as an indication only. The actual connections shall be made and to best suit each particular case, provide for expansion, circulation and minimize the amount of space required.

B. Drawings do not show all offsets, fittings, accessories and details which may be required. The CONTRACTOR shall examine all of the Drawings and Specifications for conditions which may affect the installation of his work, and shall arrange his work accordingly. Provide all required items to complete the systems to the extent required by the Drawings and Specifications.

C. If piping can be run to better advantages, the CONTRACTOR, before proceeding with the Work, shall prepare and submit complete drawings showing all details of the proposed rearrangement for written approval.

1.05 SUBMITTALS

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A. In accordance with the procedures and requirements set forth in Section 01300, the CONTRACTOR shall obtain from the manufacturer and submit the following submittals.

B. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information and design calculations required for evaluation of the compliance of the proposed equipment with the Contract Documents.

C. Partial, incomplete or illegible submittals will be returned to the CONTRACTOR without review for resubmittal.

1. Submit product literature for materials specified.
2. Submit shop drawings for piping systems, roof supports, sizing, and valving arrangements.
3. Submit tightness test results.
4. Deviations from drawings and specifications.

1.06 QUALITY ASSURANCE AND QUALIFICATIONS

A. The equipment covered by these specifications is intended to be standard equipment of proven performance as manufactured by reputable concerns. In conformance with Division 1, equipment shall be designed, constructed and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed in accordance with the best practices of the trade and as shown on the Contract Drawings.

B. Manufacturers, subcontractors, and dealers shall be submitted for approval in accordance with Division 1.

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C. Federal Clean Air Act, Section 608:

1. CONTRACTOR shall adhere to the requirements of Section 608 of the Federal Clean Air Act for handling, capture, removal, recycling, disposal, etc. of hydrochloroflurocarbon (HCFC) and chlorofluorocarbon (CFC) substances used as refrigerants or otherwise in existing equipment. CONTRACTOR is required to utilize only USEPA certified technicians to remove, service, maintain, dispose of, etc. equipment containing such substances. CONTRACTOR is also required to certify that they own certified recovery or recycling equipment necessary to perform such work before being permitted to prepare for or engage in such work.

1.07 DELIVERY, STORAGE AND HANDLING

A. Store to keep material clean and free from damage.

B. Handle to prevent damage during installation and storage.

C. Items to be incorporated into wall construction shall be delivered to job site in sufficient time so as not to hold up construction.

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS

A. Rigid Tubing

1. Refrigerant pipe shall be Type ACR, per ASTM B280, streamlined hard temper and cleaned and dehydrated copper tubing supplied with nitrogen charge and pressure tight plugs for each length.
2. Condensate drain pipe shall be Type K, per ASTM B88, copper piping.

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B. Fittings:

1. Pipe fittings shall be streamlined pattern wrought copper.
2. Unions shall be wrought copper; 300 psig working pressure; female pattern; brass to brass seat; ground joint; solder to solder connections; conform to ASTM B75.
3. Flanges shall be wrought copper; 300 psig working pressure; tong-and-groove raised ground face; bolt holes spot faced; conform to ASTM B75.
4. Gaskets shall be of a material suitable for the refrigerant, temperature and pressure for which they will be used.

C. Joints:

1. All joints shall be high temperature silver brazed joints in accordance with AWS A5.8.

2.02 VALVES

A. Manual shut-off valves shall be ball type; brass body with chrome plated ball with Teflon ball seals; solder connections; 500 psig working pressure U.L. labeled. Arrows on forged brass body and stem show flow direction. Manufactured by Henry Valve Co., or approved equal.

B. Check valves shall provide positive seal against reverse flow; spring loaded mechanism; neoprene seats; brass body; 425 psig working pressure; sized as required for application.

C. Hermetic, direct acting solenoid valves shall be normally closed type; dual voltage 4-wire coil as required; manual lift stem; solder connections. 500 psig working pressure. Pressure drop not to exceed 2 psig when full open.

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D. Expansion valves shall be sized as required by specific evaporator requirements; solder-flange connections; thermostatic modulating type; complete with sensing bulb and distributor.

2.03 ACCESSORIES

A. Liquid and moisture indicators shall be single port type; forged brass body; reversible color moisture indicator; minimum 500 psig working pressure; leakproof; solder connections; self-cleaning molded sight glass with brass safety cap; U.L. labeled. Manufactured by Sporlan Valve Co., Series See All, or approved equal.

B. Strainers shall be Y-pattern; cast bronze body; monel wire cloth screen of mesh as recommended by manufacturer; cleanout plug.

C. Vibration eliminators shall have seamless tin bronze or stainless steel core; high tensile bronze braid covering; solder connections; pressure tested; dehydrated; synthetic covering; 500 psig working pressure; U.L. labelled; minimum 7 inches in length.

D. Liquid line driers shall be combination filter-drier type; angle type solder connections; heavy steel body, neoprene gasketed removable flange; spring loaded core; replaceable non-dusting and non-channeling molded desiccant briquettes; sintered bronze outlet filter; suitable for 500 psig working pressure; U.L. labeled; pressure drop not to exceed 1 psig.

E. The CONTRACTOR shall coordinate accessories included in packaged air cooled condensing units. Any accessories not included in packaged unit shall be furnished and installed in refrigerant piping.

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F. The CONTRACTOR shall buy and install a complete charge of refrigerant.

2.04 EQUIPMENT MOUNTING SUPPORTS

A. Refrigerant piping support channels shall be mounted to the equipment mounting supports with Type 316 stainless steel rods and flanges.

2.05 HANGERS AND SUPPORTS

A. The CONTRACTOR shall provide and install all hangers, rods, supports, bolts, nuts, washers, inserts, and appurtenances as required to mount piping. See Specification 15060 for additional requirements for hangers and supports.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine areas to receive piping, valves and accessories for:
   1. Defects that adversely affect execution and quality of work.
   2. Deviations beyond allowable tolerances for piping, valves and accessories.
   3. Start work only when conditions are satisfactory.

B. Material Cleaning
   1. Thoroughly clean all piping, fittings, valves and accessories prior to installation.

3.02 INSTALLATION

A. All refrigerant piping installations shall conform with ANSI B9.1. Conform to all applicable regulatory and standards listed in paragraph 1.03.

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B. Reduction in pipe sizes shall be made using concentric reducer couplings.

C. Manual shut-off valves shall be installed on each side of strainers and driers, in liquid and suction lines at evaporator coils, and elsewhere as shown on the Drawings.

D. Each drier shall have a 3-valve full by-pass connection.

E. Each gage shall have a cap seal type throttling valve.

F. Joints shall be made using a brazing compound, containing silver alloys having a melting point of 1350 degrees F or higher, Silfos or approved equal.

G. Strainers shall be installed immediately upstream of each expansion and solenoid valve, evaporator pressure regulator, back pressure valve, compressor suction valve, and as elsewhere shown on the Drawings.

H. Liquid-moisture indicators shall be installed upstream of any expansion valves, in the liquid line to the receiver, and elsewhere as shown on the Drawings.

I. Gages shall be installed on both the suction and discharge of the compressor and elsewhere as shown on the Drawings.

J. Vibration eliminators shall be used for all inlet and discharge final connections to compressors and other vibration producing equipment.

K. All pipes, whether insulated or not, shall be identified with pipe labels and the direction of flow indicated.

L. Install oil traps and oil return line tubing in refrigerant piping as required.

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M. Refer to Specification Section 15060 for pipe hangers and supports.

N. Field coordinate for exact pipe penetrations and routing of all piping.

O. Provide flashing and counter flashing for equipment mounting supports.

3.03 IDENTIFICATION

A. Each piping shall be identified with the equipment item numbers given on the Contract Drawings. A corrosion resistant tag or nameplate, securely affixed in a conspicuous place on each unit shall give the equipment item number, manufacturers name or trademark and such other information as the manufacturer may consider necessary, or as specified, to complete identification.

3.04 TESTING

A. General

1. Shall be performed as specified herein and in accordance with Division 1.

B. Certified Shop Tests:

1. All certified shop test shall be performed and the shop test reports submitted prior to scheduling the witness shop test.

C. Field Tests:

1. Remove and plug the connection points of any controls or relief valves that could be damaged by test pressure.
2. Remove all expansion valves and install temporary bypasses.
3. Front seat both the compressor suction and discharge valves.

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4. Open the liquid line shutoff valve at the condenser, and any auxiliary valves in the hot gas and liquid lines.
5. Apply control power to open all solenoid valves.
6. Connect a cylinder of oil pumped, dry nitrogen to the front seat port of the compressor discharge valve.
7. Introduce dry nitrogen into the system to a pressure of 150 psig.
8. Using a rubber mallet, tap each solder connection sufficiently hard to start any leak that might subsequently open from thermal expansion and contraction or vibration.
9. Test all piping for leaks by observing system pressure drop and applying a bubble test to all joints and connections.
10. After testing is completed, bleed the test pressure and repair any leaks found.
11. After the system is assumed to be free of leaks, charge enough refrigerant through the liquid line charging valve to raise the pressure to 15 psig. Remove the refrigerant connection and charge enough dry nitrogen into the system to raise the test pressure to 150 psig.
12. Test all joints with a Halide torch or electronic leak detection meter. Record all test results.
13. After the results of the pressure tests have been approved, release test pressure and mechanically evacuate the system to a minimum of 22 inches Hg vacuum and maintain for 24 hours with no leaks. Disconnect the vacuum pump prior to vacuum leak test.
14. Record and report the test results.
15. After test results have been approved by the ENGINEER, remove plugs and temporary bypass, and fully charge the system with the specified refrigerant.

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16. All leaking joints shall be disassembled and remade using new materials. Retesting shall be conducted on all portions failing the tests.

END OF SECTION 15506

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SPECIFICATION 15738

SPLIT SYSTEM HEAT PUMP UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The Contractor shall provide all labor, materials, equipment and incidentals to furnish and install all Split System Heat Pump Units with the requirements specified herein and as shown on the Contract Drawings or specified in the Specifications.

B. Each system shall be furnished complete with an indoor evaporator/air conditioning unit, an outdoor air cooled condenser unit, refrigerant piping, insulations, control wiring and all accessories, special tools, spare parts, base attachments, mountings, anchor bolts and other appurtenances as specified or as may be required for a satisfactory installation.

1.02 RELATED SPECIFICATIONS

A. Specification 03300 - Cast-In Place Concrete

B. Specification 09900 - Painting

C. Specification 15050 - Vibration, and Wind Controls

D. Specification 15076 - Piping and Equipment Identification

E. Specification 15951 - Testing, Adjusting and Balancing

1.03 PAYMENT

A. Payment for work furnished and installed under this Section shall be as specified in the Specification.

1.04 REFERENCES

A. Equipment shall comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

1. American Society of Mechanical Engineers (ASME)
2. American Society of Testing and Materials (ASTM)
3. Air Conditioning and Refrigeration Institute (ACRI)
4. National Fire Protection Association (NFPA)
5. National Electrical Code (NEC)
6. Applicable Federal, State and local laws and/or ordinances

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B. Where conflict arises between the local codes and the requirements of the National Electrical Code, The National Fire Code, NEMA, ASTM, etc., the more stringent requirements shall prevail.

1.05 SUBMITTALS

A. In accordance with the procedures and requirements set forth in Division 1 of the Specifications the Contractor shall obtain from the equipment manufacturer and submit the following:

1. Shop Drawings

2. Preliminary Operation and Maintenance Manuals

3. Final Operation and Maintenance Manuals

4. Spare Parts List

5. Special Tools List

6. Reports of Certified Shop Tests

B. Each submittal shall be identified as specified in Division 1 of the Specifications.

C. Shop Drawings:

1. Each submittal shall be complete in all aspects incorporating all information and data listed herein and all additional information required to evaluate the proposed piping material's compliance with the Contract Documents. Partial or incomplete submissions shall be returned to the Contractor disapproved without review.

2. Partial, incomplete or illegible submissions will be returned to the Contractor without review for resubmittal.

3. Shop drawings shall include but not be limited to:

a. Equipment specifications and data sheets identifying all materials used and methods of fabrication.

b. Complete assembly, layout, installation drawings with clearly marked dimensions.

c. Interconnecting wiring diagram.

d. Example equipment nameplate data sheet.

D. Operations and Maintenance Manuals

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1. The Contractor shall submit operation and maintenance manuals in accordance with the procedures and requirements set forth in Division 1 of the Specifications.

2. Two copies of a preliminary O&M manual shall be included in the shop drawing submittal. Without inclusion of these manuals, the submittal will be considered incomplete and will be returned without review.

1.06 QUALITY ASSURANCE AND QUALIFICATIONS

A. The equipment covered by these specifications is intended to be standard equipment of proven performance as manufactured by reputable concerns. In conformance with Division 1 of the Specifications, equipment shall be designed, constructed and installed in accordance with the best practices of the trade, and as shown on the Contract Drawings.

B. Names of manufacturers, subcontractors, and dealers shall be submitted for approval in accordance with Division 1 of the Specifications.

C. Refrigeration equipment shall be listed and labeled to UL 1995-2005. UL listing shall be indicated on the Shop Drawings.

D. Refrigeration system shall be constructed in accordance with ASHRAE 15-2022: Safety Standard for Refrigeration Systems and ASHRAE 34-2019.

1.07 SPARE PARTS AND SUPPLIES

A. Furnish all special tools necessary to dissemble, service, repair and adjust the equipment.

B. The following spare parts shall be furnished with each unit:

1. Two (2) sets of Filters

C. Furnish additional spare parts as recommended by the equipment manufacturers.

D. Spare parts lists, included with the shop drawing submittal shall indicate specific sizes, quantities, and part numbers of the items to be furnished. Terms such as "1 lot of packing material" are not acceptable.

E. Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. Each part shall be properly identified by a separate number. Those parts which are identical for more than one size, shall have the same parts number.

1.08 WARRANTY

A. Split heat pump units shall have a 2-year parts warranty and the compressors shall be covered by an additional 3-year warranty. The installing contractor shall be responsible for warranty service and emergency repair during the first 24 months

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of the system operation. The warranty shall include parts, labor, and travel costs incurred by the manufacturer to provide factory authorized on-site services. Equipment submittals will not be approved until submission of the manufacturer's warranty indicating compliance with the above.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Approved Manufacturers:

1. Mitsubishi Electric Corp.
2. Sanyo Fisher Co.
3. Coolair Corp.
4. Daikin Industries

2.02 SINGLE EVAPORATOR DUCTLESS SPLIT HEAT PUMP SYSTEM

A. Provide an air-to-air electric heat pump (outdoor unit) in combination with a direct expansion fan-coil heat pump (indoor unit) in the location shown on the Drawings. The units shall be designed and tested for use with Refrigerant R-454B and be equipped with refrigerant line fittings. The electrical requirements, the size, the cooling and heating capacities shall be as indicated on the Drawings.

B. Unit shall be factory assembled, piped, and internally wired. Units shall be UL listed and carry a UL label. Unit shall be factory run-tested to check cooling and heating operation, defrost operation, fan and blower rotation and control sequence. Unit shall be designed to operate at ambient temperature between 115°F and 55°F in cooling mode (as shipped) and between 75°F and 0°F in heating mode.

C. All coils shall be constructed with aluminum plate fins mechanically bonded to Oxygen Free Copper (OFC) or aluminum tubing with all joints brazed and outdoor coil shall be coated with factory-applied anti-corrosion coating to prevent leaks due to corrosion.

D. The outdoor unit shall contain a semi-hermetic compressor with crankcase heater, automatically reversible oil pump, internal and external motor protection. Outdoor fan shall be propeller type, with vertical discharge and direct driven by a factory-lubricated motor. refrigerant circuit access ports located outdoors shall be fitted with locking-type tamper-resistant caps requiring a special tool or key to open.

E. Indoor unit shall operate properly on horizontal position (with or without) ductwork. Unit shall have electric resistance heaters as specified for back-up of heat pump heating capacity and shall contain refrigerant metering device and indoor fan relay. Fan shall be centrifugal type, belt driven.

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F. Controls and protective devices shall include a high pressurestat, loss-of-charge pressurestat, crankcase heater, suction line accumulator and pressure relief device. Motor compressor shall have both thermal and current sensitive overload devices. The outdoor unit shall provide short cycle protection or safety lockout compressor protection.

G. Defrost control shall sense need to defrost every 90 minutes based on liquid temperature. On system using multiple units, a defrost interlock control shall be provided. A 24-volt transformer shall be factory installed and wired on outdoor units for external control circuit.

H. System accessories shall include indoor remote controller, outdoor thermostat, head pressure control, heat pump piping package, return air grille, MERV 7 filters, electric resistance heaters, discharge air grille and plenum, suspension package, indoor coil defrost thermostat, sub-base, fan and drives, outdoor fan cycling thermostat, emergency heat control package, compressor short cycle protection and sequencer control.

I. Each Unit shall have a refrigerant leak detector to comply with ASHRAE 15 safety requirement for A2L refrigerant.

J. Each unit shall have the cooling and heating capacity, phase, voltage and amperage shown on the Drawings. Provide a metal name plate securely attached to the side of the unit (outdoor and indoor), readily visible. The name plate shall have inscribed on it, the following information in clear and legible lettering, manufacturer's name, Model No., month and year of installation, BTUH Rating, voltage and current rating for each unit.

K. Provide a hard wired remote controller for each indoor unit. Each indoor unit shall be provided with a dedicated BACnet gateway that can be integrated into a BACnet/IP or BACnet MS/TP network. Alternate acceptable architecture is to have a centralized BACnet controller that connects to each outdoor unit and in turn is integrated into a BACnet/IP network.

2.03 VARIABLE-REFRIGERANT-FLOW, HEAT PUMP SYSTEM

1. Heat Recovery System Operation: System capable of operation with simultaneous heating and cooling zones that transfer heat between zones.

2. The system shall be of the variable capacity, VRF heat pump heat recovery air type and shall be a split VRF system consisting of multiple indoor units, DDC controls and single outdoor unit. Up to eight (8) indoor units may be connected to a single outdoor unit, each of which can be independently controlled. The units shall be designed and tested for use with refrigerant R-32 and be equipped with refrigerant line fittings which permit mechanical or brazed connection.

3. Provide ductless VRF heat pump units in the location shown on the Drawings. The electrical requirements, the size, the cooling and heating capacities shall be as indicated on the Drawings.

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4. Units shall be factory assembled, piped and internally wired. Units shall be UL listed and carry a UL label. Units shall be factory tested.

5. Outdoor Unit

   a. Description: Factory-assembled and -tested complete unit with components, piping, wiring, and controls required for mating to piping, power, and controls field connections. Specially designed for use in systems with simultaneous heating and cooling.

   b. Systems shall consist of one unit, or multiple unit modules that are designed by variable refrigerant system manufacturer for field interconnection to make a single refrigeration circuit that connects multiple indoor units.

   c. The outdoor unit shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory.

      1) Both refrigerant lines from the outdoor unit to the indoor units shall be insulated. Refrigerant circuit access ports located outdoors shall be fitted with locking-type tamper-resistant caps requiring a special tool or key to open.

   d. Unit Cabinet

      1) Galvanized steel and coated with a corrosion-resistant finish.

      2) Mounting: Manufacturer-designed provisions for field installation.

      3) Internal Access: Removable panels or hinged doors of adequate size for field access to internal components for inspection, cleaning, service, and replacement.

   e. Fan

      1) Fan(s): Propeller type.

      2) Direct-drive arrangement.

      3) Fabricated from non-ferrous components or ferrous components with corrosion protection finish to match performance indicated for condenser coil.

      4) Statically and dynamically balanced.

      5) Fan Guards: Removable safety guards complying with OSHA regulations. If using metal materials, coat with

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corrosion-resistant coating to match performance indicated for condenser coil.

6) Motor(s): Brushless dc or electronically commutated with permanently lubricated bearings and rated for outdoor duty.

7) Motor Protection: Integral protection against thermal, overload, and voltage fluctuations.

8) Speed Settings and Control: Variable speed with a speed range of least 75 percent.

9) Vibration Control: Integral isolation to dampen vibration transmission.

f. Condenser Coil

1) Plate Fin Coils

a) Casing: Aluminum, galvanized, or stainless steel.

b) Fins: Aluminum or copper, mechanically bonded to tubes, with arrangement required by performance.

c) Tubes: Copper, of diameter and thickness required by performance.

2) Aluminum Microchannel Coils:

a) Series of flat tubes containing a series of multiple, parallel-flow microchannels layered between refrigerant header manifolds.

b) Single- or multiple-pass arrangement.

c) Construct fins, tubes, and header manifolds of aluminum alloy.

3) Coating: None.

g. Compressor

1) One or more positive-displacement, direct-drive and hermetically sealed scroll compressor(s) with inverter drive and turndown to 15 percent of rated capacity.

2) Protection: Integral protection against the following:

a) High refrigerant pressure.

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b) Low oil level.

c) High oil temperature.

d) Thermal and overload.

e) Voltage fluctuations.

f) Phase failure and phase reversal.

g) Short cycling.

3) Speed Control: Variable to automatically maintain refrigerant suction and condensing pressures while varying refrigerant flow to satisfy system cooling and heating loads.

4) Vibration Control: Integral isolation to dampen vibration transmission.

5) Oil management system to ensure safe and proper lubrication over entire operating range.

6) Crankcase heaters with integral control to maintain safe operating temperature.

7) Fusible plug.

l. Electrical

1) Enclosure: Metal, similar to enclosure, and suitable for unprotected outdoor locations.

2) Field Connection: Single point connection to power entire unit and integral controls.

3) Disconnecting Means: Factory-mounted circuit breaker or switch, complying with NFPA 70.

4) Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.

6. Indoor Unit (Ceiling Type)

a. The indoor unit shall be a cassette design unit that recesses into the ceiling with ceiling grilles or ducted unit located above the suspended ceiling as shown on the Drawings. Units shall have a modulating linear expansion device, and controls that are used with the outdoor unit.

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b. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3 minute time delay mechanism, an auto restart function, an emergency operation function and a test run switch. Indoor unit and refrigerant pipes will be charged with dehydrated air before shipment from the factory.

c. Each Unit shall have a refrigerant leak detector to comply with ASHRAE 15 safety requirement for A2L refrigerant.

d. Unit Cabinet

1) Material: Painted steel, or coated steel frame covered by a plastic cabinet, with an architectural acceptable finish suitable for tenant occupancy on exposed surfaces.
2) Insulation: Manufacturer's standard internal insulation, complying with ASHRAE 62.1, to provide thermal resistance and prevent condensation.
3) Mounting: Manufacturer-designed provisions for field installation.
4) Internal Access: Removable panels of adequate size for field access to internal components for inspection, cleaning, service, and replacement.
5) Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.

e. Fan

1) The fan shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings.

2) The indoor fan shall consist of a minimum of two speeds selected by the controller.

f. Filter

1) Return air shall be filtered by means of a long-life filter to comply with ASHRAE 52.2, MERV 7.

g. DX Coil

1) Coil Casing: Aluminum, galvanized, or stainless steel.

2) Coil Fins: Aluminum, mechanically bonded to tubes, with arrangement required by performance.

3) Coil Tubes: Copper, of diameter and thickness required by performance.

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4) Expansion Valve: Electronic modulating type with linear or proportional characteristics.

5) Internal Tubing: Copper tubing with brazed joints.

6) Internal Tubing Insulation: Manufacturer's standard insulation, of thickness to prevent condensation.

7) Factory Charge: Dehydrated air or nitrogen.

8) Testing: Factory pressure tested and verified to be without leaks.

9) A condensate pan and drain shall be provided under the coil.

10) The condensate pump shall be able to raise drain water 33” above the condensate pan.

11) Both refrigerant lines from the outdoor unit to the indoor units shall be insulated.

h. Electrical

1) The unit electrical power shall be 230 volts, 1 phase, 60Hz.

2) The system shall be capable of satisfactory operation within voltage limits of 198 volts to 254 volts. Units shall have electric resistance heaters as specified for back-up of heat pump heating capacity.

7. Controls

1) This unit shall have digital controls.

2) Enclosure: Manufacturer's standard, and suitable for indoor locations.

3) Factory-Installed Controller: Configurable digital control.

4) Each control panel must have a LCD (Liquid Crystal Display) that shows room temperature, set point, mode of operation (on/off/cool/heat) and fan speed.

5) Features and Functions: Self-diagnostics, time delay, auto-restart, auto operation mode, filter service notification, power consumption display, drain assembly high water level safety shutdown and notification, run test switch.

b. Electrical Characteristics

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1) Enclosure: Manufacturer's standard, and suitable for indoor locations.

2) Field Connection: Single point connection to power entire unit and integral controls.

3) Disconnecting Means: Factory-mounted circuit breaker or switch, complying with NFPA 70.

4) Control Transformer: Manufacturer's standard. Coordinate requirements with field power supply.

5) Wiring: Manufacturer's standard with each connection labelled and corresponding to a unit-mounted wiring diagram.

6) Raceways: Enclose line voltage wiring in metal raceways to comply with NFPA 70.

8. Provide an automatic defrost cycle to prevent coil freeze-up during heat pump operation.

PART 3 EXECUTION

3.01 INSTALLATION

A. Split System Heat Pumps Units shall be installed, connected and placed in satisfactory working order in accordance with the manufacturer's instructions and details, and the Contract Drawings. The Contractor shall furnish and install interconnecting wiring and conduits between the field mounted devices and the unit.

B. Install outdoor unit with mounting legs supplied by the manufacturer, on prefabricated roof equipment curbs provided by the contractor, with all the clearances required as shown on the Drawings.

C. Install the indoor unit with the suspension package tied to the overhead construction as shown on the Drawings.

D. Install the wall mounted unit as close as possible to the ceiling clear of any obstruction in front of unit by at least 5’0”.

E. For ceiling hung units, Contractor shall provide secondary condensate drain protection for each cooling or evaporator coil to avoid damage to any building component as a result of overflow from the primary equipment drain pan or stoppage in the primary condensate drain piping. One of the following methods shall be used:

1. Contractor shall coordinate with sheet metal subcontractor to provide an auxiliary drain pan with a separate drain under the coils on which

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condensation will occur. The auxiliary pan drain shall discharge to a conspicuous point of disposal to alert occupants in the event of a stoppage of the primary drain. The auxiliary pan shall have a minimum depth of 1.5", shall not be less than 3" larger than the unit or the coil dimensions in width and length and shall be constructed of corrosion-resistant material. Auxiliary metallic pans shall have a minimum thickness of not less than 0.0236" (No. 24 gage) for galvanized sheet metal pans, 0.0179" (No. 26 gage) for stainless steel pans, or 0.0320" (No. 20 gage) for aluminum pans. Nonmetallic pans shall have a minimum thickness of not less than 0.0625"

2. Contractor shall provide a separate overflow drain line connected to the primary drain pan provided with the equipment. Such overflow drain shall discharge to a conspicuous point of disposal to alert occupants in the event of a stoppage of the primary drain. The overflow drain line shall connect to the primary drain pan at a higher level than the primary drain connection or

3. Contractor shall coordinate with sheet metal subcontractor to provide an auxiliary drain pan without a separate drain line under the coils on which condensate will occur. Contractor shall provide a hard-wired water-level detection device for the auxiliary pan that will shut off the equipment served prior to overflow of the auxiliary pan. The auxiliary pan shall have a minimum depth of 1.5", shall not be less than 3" larger than the unit or the coil dimensions in width and length and shall be constructed of corrosion-resistant material. Auxiliary metallic pans shall have a minimum thickness of not less than 0.0236" (No. 24 gage) for galvanized sheet metal pans, 0.0179" (No. 26 gage) for stainless steel pans, or 0.0320" (No. 20 gage) for aluminum pans. Nonmetallic pans shall have a minimum thickness of not less than 0.0625"

F. Install all other accessories as required by the manufacturers and indicated on the Drawings.

G. Clearances shall be maintained around all components so as to permit inspection, servicing, repair, replacement and visibility of all appurtenances. When units are installed or replaced, clearance shall be provided to allow access for inspection, maintenance and repair. Passageways around all sides of the units shall have an unobstructed width as required by the manufacturer.

3.02 CONTROL SEQUENCE FOR VARIABLE-REFRIGERANT-FLOW, HEAT PUMP SYSTEM

A. Cooling

1. If power to unit has been off for an extended period of time, crankcase heater shall be energized at least 24 hours prior to starting compressor.

2. The indoor fans, outdoor fans and compressor shall start immediately upon command from the controlling thermostat or the remote microprocessor control in either the cooling or the heating mode of operation. When first stage cooling is required, the first cooling stage of the thermostat shall

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close causing the heat pump to start with an unloaded compressor. When the second cooling stage of the thermostat closes demanding additional cooling, the compressor shall load. In a system with a one stage thermostat, the unit shall be wired so the compressor starts fully loaded.

B. Heating

1. When the thermostat calls for heating, the indoor fan motor, outdoor fan motors and the compressor (fully loaded) shall be energized.

C. Defrost cycle

1. Defrost shall be initiated every 90 minutes. The cycle shall begin when the defrost timer motor contacts close for 20 seconds, and if the defrost thermostat is closed, the reversing valve and outdoor air fans shall be de-energized. The unit shall operate in this modified cooling mode to defrost the coil. This defrost cycle shall continue until the defrost thermostat opens or 10 minutes have elapsed.

3.03 CONTROL SEQUENCE FOR DUCTLESS SINGLE EVAPORATOR UNIT

A. Cooling

1. If power to unit has been off for an extended period of time, crankcase heater shall be energized at least 24 hours prior to starting compressor.

2. If cooling is required, the indoor and outdoor units shall start immediately upon command from the microcomputer control.

B. Heating: When the microcomputer controls calls for heating, the indoor and outdoor units shall be energized.

3.04 IDENTIFICATION

A. Each unit of equipment shall be identified with the equipment item numbers given on the Contract Drawings and in Division 1 of the Specifications. A corrosion resistant tag and nameplate, securely affixed in a conspicuous place on each unit shall give the equipment item number, manufacturer's name or trademark and such other information as the manufacturer may consider necessary, or as specified, to complete identification.

3.05 TESTING

A. All tests shall be performed in accordance with the requirements of Division 1 of the Specifications.

B. Field tests shall be performed in accordance with Specification 15951, Testing, Adjusting and Balancing and Division 1 of the Specifications.

3.06 MANUFACTURER'S REPRESENTATIVE

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A. The Contractor shall provide the services of a qualified manufacturer's technical representative who shall adequately supervise the installation and testing of all equipment furnished under this Contract. The services of the manufacturer's representative shall be provided for a period of not less than 3 days as follows:

1. One trip of 1 day during installation of the equipment.

2. One trip of 1 day for startup.

3. One trip of 1 day for training.

B. Any additional time required to achieve successful installation and operation shall be at the expense of the Contractor. The manufacturer's representative shall sign in and out each day he is at the project. Travel time to and from the Site shall not be included in measuring the above visits. Only time spent on the Site shall be counted. One day is 8 hours exclusive of travel and lodging time.

C. Training

1. The Contractor shall provide training for Building personnel in accordance with Division 1 - General Requirements.

2. The Contractor shall include in his request for manufacturer approval a certification that the manufacturer has been advised of the requirements of Division 1 - General Requirements, and that the costs associated with said training submittals and training have been included in the manufacturer's pricing.

D. Lubricants

1. The manufacturer shall submit a list with a minimum of four manufacturer’s standard lubricants which may be used interchangeably for each type of lubricant required.

2. The Contractor shall utilize this list in preparing his comprehensive lubrication survey as specified in Division 1.

E. The manufacturer's time for training as specified by Division 1 and as specified herein shall not be included under this paragraph.

END OF SECTION 15738

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SECTION 15750

AIR CONDITIONING UNITS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The CONTRACTOR shall furnish and install all air conditioning units and air cooled condensing units with the requirements specified herein and as shown on the Contract Drawings.

B. The equipment shall be furnished complete with all accessories, special tools, spare parts, base attachments, mountings, anchor bolts and other appurtenances as specified or as may be required for a satisfactory installation.

1.02 RELATED DETAILED SPECIFICATIONS

A. Specification 03300 - Cast-In-Place Concrete.

B. Specification 09900 – Painting.

C. Specification 15076 – Piping, Ductwork, and Equipment Identification.

D. Specification 15081 – Pipe Insulation.

E. Specification 15506 - Refrigerant Piping System.

F. Specification 15951 - Testing, Adjusting, and Balancing.

G. Specification 16150 - Electric Motors.

1.03 REFERENCES

A. Equipment shall comply with the latest applicable provisions and recommendations of the following, except as otherwise shown or specified.
   1. American Society of Mechanical Engineers (ASME).
   2. American Society of Testing Materials (ASTM).
   3. Air Movement and Control Association (AMCA).
   4. Air Conditioning and Refrigeration Institute (ACRI).
   5. National Fire Protection Association (NFPA).
   6. National Electrical Code (NEC).
   7. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).
   8. Applicable Federal, State and local laws and/or ordinances.
   9. ANSI/ASHRAE 15 - Safety Code for Mechanical Refrigeration.
   10. ANSI/ASHRAE/IES 90 A - Energy Conservation in New Building Design Standard.
   11. AHRI 210/240 - Unitary Air-Conditioning Equipment and Air-Source Heat Pump Equipment, (less than 135,000 Btuh).
   12. AHRI 360 - Commercial and Industrial Unitary Air Conditioning Equipment testing and rating standard, (equipment greater than 135,000 Btuh).
   13. AHRI 340 - Commercial and Industrial Unitary Heat pump Equipment, (heat pumps above 135,000 Btuh).

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14. ANSI Z21.47/UL1995 - Unitary Air Conditioning Standard for safety requirements.

B. Where conflict arises between the local codes and the requirements of the National Electrical Code, The National Fire Code, National Electrical Manufacturers Association (NEMA), ASTM, etc., the more stringent requirements shall prevail.

1.04 QUALITY ASSURANCE

A. The equipment covered by these Specifications is intended to be standard equipment of proven performance as manufactured by reputable concerns. Equipment shall be designed, constructed and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as shown on the Contract Drawings.

B. It is the intent of these specifications that all components of the air conditioning unit be provided by one vendor who shall have the sole responsibility of matching all components and providing equipment which functions together as a system.

C. Unit shall be manufactured to conform to UL 1995 and shall be listed by either UL/CUL or ETL. Units shall be provided with listing agency label affixed to the unit. In the event the unit is not UL/CUL or ETL approved, the CONTRACTOR shall, at his/her expense, provide for a field inspection by a UL/CUL or ETL representative to verify conformance. If necessary, CONTRACTOR shall perform modifications to the unit to comply with UL/CUL or ETL as directed by the representative, at no additional expense to the owner.

D. Air handling units shall be certified in accordance with AHRI Standard 430. Units meeting AHRI Standard 430 certification shall have a label affixed to the unit. If the unit is not AHRI 430 certified, or tested in accordance with AHRI 430 then the CONTRACTOR shall be responsible for expenses associated with testing of units after installation to verify performance of fan(s). Any costs incurred to adjust fans to meet scheduled capacities shall be the sole responsibility of the CONTRACTOR.

E. Certify air handling coils in accordance with AHRI Standard 410. Units shall be provided with certification label affixed to the unit. If air handling coils are not certified in accordance with AHRI Standard 410, CONTRACTOR shall be responsible for expenses associated with testing of coils after installation to verify performance of coil(s). Any costs incurred to adjust coils to meet scheduled capacities shall be the sole responsibility of the CONTRACTOR.

F. Units shall be as manufactured by Trane, York, or Carrier.

1.05 SUBMITTALS

A. In accordance with the procedures and requirements set forth in Section 01300, the CONTRACTOR shall obtain from the equipment manufacturer and submit the following:
   1. Shop Drawings.
   2. Preliminary Operation and Maintenance Manuals.

3. Final Operation and Maintenance Manuals.
4. Spare Parts List.
5. Special Tools List.
6. Reports of Certified Shop Tests.

B. Each submittal shall be identified by the applicable equipment identification number and specification section.

C. Shop Drawings
1. Each submittal shall be complete in all respects, incorporating all information and data listed herein and all additional information required for evaluation of the proposed equipment's compliance with the Contract Documents.
2. Partial, incomplete or illegible submissions will be returned to the CONTRACTOR without review for resubmittal.
3. Shop drawings shall include but not be limited to:
   a. Equipment specifications and data sheets identifying all materials used and methods of fabrication.
   b. Complete assembly, layout, installation and foundation drawings with clearly marked dimensions.
   c. Fan performance curve indicating the operating point.
   d. Internal static pressure including drop thru heating coil, DX Coil, unit mounted accessories and 0.3-inch for filter dirt shall not exceed the difference between the total and external static pressures.
   e. Motor nameplate data as specified in Specification 16150 - Electric Motors.
   f. Copies of the manufacturers specifications type size, performance characteristics, efficiency installation instructions, detailed drawings for vibration isolators.
   g. Details of corrosion-resistant coating.
   h. Weights of all components parts, assembled weight of units and approximate total shipping weight.
   i. Example equipment nameplate data sheet.
   j. Interconnecting wiring diagrams.
   k. List of recommended lubricants.

D. Operations and Maintenance Manuals
1. The CONTRACTOR shall submit operation and maintenance manuals in accordance with the procedures and requirements set forth in Section 01730.

1.06 SPARE PARTS, TOOLS AND SUPPLIES

A. Furnish all special tools necessary to disassemble, service, repair and adjust the equipment.

B. The following spare parts shall be furnished with each unit:
1. Four sets of complete change of filters.

C. Furnish all spare parts as recommended by various equipment manufacturers.

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D. Spare parts lists, included with the shop drawing submittal shall indicate specific sizes, quantities, and part numbers of the items to be furnished. Terms such as "1 lot of packing material" are not acceptable.

E. Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. Each part shall be property identified by a separate number. Those parts which are identical for more than one size, shall have the same parts number.

1.07 WARRANTY

A. All equipment supplied under this section shall be warranted for a period of one (1) year by the MANUFACTURER. Warranty period shall commence as outlined in Section 01740 and SJCUD General Conditions.

B. The equipment shall be warranted to be free from defects in workmanship, design and materials. If any part of the equipment should fail during the warranty period, it shall be replaced in the machine(s) and the unit(s) restored to service at no expense to the OWNER.

C. The MANUFACTURER'S warranty period shall run concurrently with the CONTRACTOR'S warranty period. No exception to this provision shall be allowed.

PART 2 - PRODUCTS

2.01 AIR CONDITIONING UNITS (AHU-1)

A. Unit Casing
1. The entire air handler shall be constructed of galvanized steel. Casing finished to meet ASTM B117 250-hour salt-spray test. The removal of access panels or access doors shall not affect the structural integrity of the unit. All removable panels shall be gasketed. All doors shall have gasketing around full perimeter to prevent air leakage. CONTRACTOR shall be responsible to provide connection flanges and all other framework that is needed to properly support the unit.
2. All panels shall be 2-inch double wall construction to facilitate cleaning of unit interior. Casing deflection shall not exceed .005-inch deflection per linear foot under negative or positive pressure, up to unit casings maximum design limit of pressure.
3. Unit floor shall be of sufficient strength to support 300-lb load during maintenance activities, and shall deflect no more than .005-inches when sitting on a support structure.
4. Panel insulation shall provide a minimum thermal resistance R value of 13 throughout the entire unit. Insulation shall completely fill the panel cavities in all directions so that no voids exist and settling of insulation is prevented. Panel assembly shall comply with NFPA 90A.
5. Access panels and/or access doors shall be provided in all sections to allow easy access to drain pan, coil(s), motor, drive components and bearings for cleaning, inspection, and maintenance.
6. Access panels and doors shall be fully removable without the use of specialized tools to allow complete access of interior surfaces.

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B. Access Doors
   1. Access doors shall be 2-inch double-wall construction. Interior and exterior shall be of the same construction as the interior and exterior wall panels.
   2. Gasketing shall be provided around the full perimeter of the doors to prevent air leakage.
   3. Door hardware shall be surface-mounted to prevent through-cabinet penetrations that could likely weaken the casing leakage and thermal performance.
   4. Handle hardware shall be designed to prevent unintended closure.
   5. Access doors shall be hinged and removable without the use of specialized tools to allow.
   6. All doors shall be a 60-inch height when sufficient unit height is available, or the maximum height allowed by the unit height.

C. Primary Drain Pans
   1. The drain pan shall be designed in accordance with ASHRAE 62.1 being of sufficient size to collect all condensation produced from the coil and sloped in two planes, pitched toward drain connections, promoting positive drainage to eliminate stagnant water conditions when unit is installed level and trapped per manufacturer's requirements. The outlet shall be located at the lowest point of the pan and shall be sufficient diameter to preclude drain pan overflow under any normally expected operating condition. Drainpan shall be corrosion resistant polymer.
   2. All drain pan threaded connections shall be visible external to the unit. Threaded connections under the unit floor shall not be accepted.
   3. Drain connections shall be of the same material as the primary drain pan and shall extend a minimum 2-1/2-inch beyond the base to ensure adequate room for field piping of condensate traps.
   4. The installing CONTRACTOR is responsible to ensure the unit is installed level, trapped in accordance with the manufacturer's requirements, and visually inspected to ensure proper drainage of condensate

D. Fans
   1. Fan sections shall have a minimum of one hinged and latched access door located on the drive side of the unit to allow inspection and maintenance of the fan, motor, and drive components.
   2. Provide fans of type and class as specified on the schedule. Belt drive fan shafts shall be solid steel, coated with a rust-inhibiting coating, and properly designed so that fan shaft does not pass through first critical speed as unit comes up to rated RPM.
   3. Belt drive fans shall be internally isolated to inhibit noise and vibration through the ductwork and building structure. A flexible connection shall be installed between the fan and unit casing to ensure complete isolation. If fans and motors are not internally isolated, then the entire unit shall be externally isolated from the building, including supply and return duct work, piping, and electrical connections. External isolation shall be furnished by the installing CONTRACTOR in order to avoid transmission of noise and vibration through the ductwork and building structure.
   4. Belt-driven fans shall be provided with self-aligning, anti-friction bearings selected for L-50 200,000-hour average life per ANSI/AFBMA Standard 9.

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5. Motors and Drives
    a. All motors and drives for belt drive fans, shall be factory-installed and run tested. Motors for belt driven fans shall be installed on a slide base to permit adjustment of belt tension. Slide base shall be designed to accept all motor sizes offered by the air-handler manufacturer for that fan size to allow a motor change in the future, should airflow requirements change. Fan sections without factory-installed motors shall have motors field installed by the CONTRACTOR. The CONTRACTOR shall be responsible for all costs associated with installation of motor and drive, alignment of sheaves and belts, run testing of the motor, and balancing of the assembly.
    b. Integral horsepower motors shall be heavy duty, open drip-proof. They shall meet or exceed all NEMA Standards Publication MG 1 - 2006 requirements and comply with NEMA Premium efficiency levels when applicable. Motors shall comply with applicable requirements of NEC and shall be UL Listed.
    c. All fan types utilizing integral horsepower motors, shall use 4-pole, 1800 rpm, motors, NEMA B design, with Class B insulation, capable to operate continuously at 104 deg F (40 deg C) without tripping overloads.
    d. Motors shall have a +/- 10 percent voltage utilization range to protect against voltage variation.
    e. V-Belt drives for housed fans shall be fixed pitch rated at 1.5 times the motor nameplate.

E. Coils
1. Coils section header end panel shall be removable to allow for removal and replacement of coils without impacting the structural integrity of the unit.
2. Install coils such that headers and return bends are enclosed by unit casing to ensure that if condensate forms on the header or return bends, it is captured by the drain pan under the coil.
3. Coils shall be manufactured with plate fins to minimize water carryover and maximize airside thermal efficiency. Fin tube holes shall have drawn and belled collars to maintain consistent fin spacing to ensure performance and air pressure drop across the coil as scheduled. Tubes shall be mechanically expanded and bonded to fin collars for maximum thermal conductivity. Use of soldering or tinning during the fin-to-tube bonding process is not acceptable due to the inherent thermal stress and possible loss of bonding at that joint.
4. Construct coil casings of galvanized steel. End supports and tube sheets shall have belled tube holes to minimize wear of the tube wall during thermal expansion and contraction of the tube.
5. All coils shall be completely cleaned prior to installation into the air handling unit. Complete fin bundle in direction of airflow shall be degreased and steam cleaned to remove any lubricants used in the manufacturing of the fins, or dirt that may have accumulated, in order to minimize the chance for water carryover.
6. Refrigerant Cooling Coils
    a. Refrigerant suction and liquid connections shall penetrate through unit casing to facilitate refrigerant piping in the field.

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b. Coils shall be proof tested to 450 psig and leak tested to 300 psig air pressure under water. After testing, insides of tubes shall be air dried, charged with dry nitrogen or dry air, and sealed to prevent contamination.
c. Refrigerant suction and liquid headers shall be constructed of copper tubing. Suction and liquid connections shall penetrate unit casings to allow for sweat connections to refrigerant lines.
d. Tubes shall be 1/2 inch O.D., minimum 0.016 inch thick copper. Fins shall be aluminum.
e. Coils shall have equalizing type vertical distributors sized in conjunction with capacities of coils.

7. Electric Heating Coils
   a. A UL-recognized electric heater shall be factory installed. Electric heat to be open-wire resistance heating, installed in the reheat position. Heater to have primary and secondary protection circuits. The contactors for energizing the electric heater shall be magnetic. Electric heaters rated above 48 amps shall be circuited so that no circuit exceeds 48 amps as required by UL and NEC.
   b. Control options for electric heat shall include:
      1) SSR-Full Modulating Control (0-10 VDC) – The electric heater shall be factory-wired to accommodate SSR-Full Modulating control. The SSR control can receive a 0-10VDC or 4-20mA signal from a standalone thermostat or building automation system providing full modulating control of the heater.

F. Filters
1. Provide factory-fabricated filter section of the same construction and finish as unit casings. Filter section shall have side access filter guides and access door(s) extending the full height of the casing to facilitate filter removal. Provide fixed filter blockoffs as required to prevent air bypass around filters. Blockoffs shall not need to be removed during filter replacement. Filters to be of size, and quantity needed to maximize filter face area of each particular unit size.
2. Provide 2” MERV 8 pleated media filters.

G. Dampers
1. All dampers shall be internally mounted. Dampers shall be premium ultra low leak and located as indicated on the schedule and plans. Parallel blade arrangement shall be provided. Dampers shall be Ruskin CD60 double-skin airfoil design or equivalent for minimal air leakage and pressure drop. Leakage rate shall not exceed 3 CFM/square foot at one inch water gauge complying with ASHRAE 90.1 maximum damper leakage and shall be AMCA licensed for Class 1A. All leakage testing and pressure ratings shall be based on AMCA Standard 500-D. Manufacturer shall submit brand and model of damper(s) being furnished, if not Ruskin CD60.

H. Factory-Installed Motor Wire Termination and Starter Enclosures
1. Starter shall be factory mounted on the drive side of the fan section.
2. Any welds shall be properly finished with no rough edges. Enclosures shall house, Drive-OFF switches, manual speed controls, and control transformers.

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I. Factory Wiring of Starters
   1. Provide with factory mounted and wired supply fan starter and DDC controls. Provide a single point of power. Line-to-24v transformers shall be provided with sufficient vA to power the factory installed control points.

J. Factory-Engineered Automatic Temperature Controls
   1. Unit shall be provided with a factory wired, installed and tested DDC unit controller, capable of standalone unit control. All control points in unit shall be tested at the unit manufacturers facility prior to shipment.
   2. Damper actuators shall be selected, provided, and mounted by the AHU manufacturer on each damper. Actuators shall be of sufficient size and quantity to ensure complete damper operation. Actuators shall be direct coupled to minimize linkage.
   3. Differential pressure switch shall be provided by the AHU manufacturer. Pressure switches shall be factory installed across the filter bank to monitor clean/dirty filter status.
   4. Low limits shall be factory engineered to maximize coil coverage. Capillary radius clips shall be used at low limit bends to ensure no crimping or wear of low limits. Low limits shall be wired to shut down the fan to protect the unit.
   5. Fan status switches shall be provided and mounted by the AHU manufacturer.
   6. Outside air temperature sensors shall be provided by the AHU manufacturer.
   7. Averaging temperature sensors shall be provided by the AHU manufacturer. Sensors shall be factory engineered to accurately measure mixed air temperatures. Capillary radius clips shall be used at capillary bends to ensure no crimping or wear of the tube.

2.02 AIR CONDITIONING UNIT (AHU-2/3)

A. General
   1. Manufacturer shall provide unit arranged for draw-through application. Unit layout and configuration shall be as defined in project plans and schedule. Blow-through is only acceptable when consideration is given to capturing downstream moisture carryover. Considerations include downstream moisture eliminators and/or extended blank modules with condensate drain pans.

B. Unit Casing
   1. The entire air handler shall be constructed of galvanized steel. The removal of side panels shall not affect the structural integrity of the unit once the unit is installed. CONTRACTOR shall be responsible to provide connection flanges and all other framework that is needed to properly support the unit.
   2. Units shall ship as one or two modules completely factory-assembled including all coils, fans, motors, drives, dampers and filters.
   3. Access Panels: Removable access panels shall be provided on both sides of the unit to facilitate service access to drain pans, motors, drive components and bearings. Panels shall be gasketed. Access panel for filter removal shall be provided on both sides of the unit.
   4. Cabinet: Casing shall be manufactured of heavy gauge galvanized steel. All removable panels shall be gasketed to minimize air leakage.

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5. Insulation - High density, matte-faced - Interior surface of unit casing shall be acoustically and thermally lined. Insulation shall have a minimum R-Value of 4 and shall be UL Listed. The insulation shall comply with NFPA-90A and B requirements.

C. Coils
1. Install coils such that headers and return bends are enclosed by unit casing to ensure that if condensate forms on the header or return bends, it is captured by the drain pan under the coil.
2. Coils shall be manufactured with plate fins to minimize water carryover and maximize airside thermal efficiency. Fin tube holes shall have drawn and belled collars to maintain consistent fin spacing to ensure performance and air pressure drop across the coil are as scheduled. Tubes shall be mechanically expanded and bonded to fin collars for maximum thermal conductivity. Use of soldering or tinning during the fin-to-tube bonding process is not acceptable due to the inherent thermal stress and possible loss of bonding at that joint.
3. Construct coil casings of galvanized steel. End supports shall have belled tube holes to minimize wear of the tube wall during thermal expansion and contraction of the tube.
4. Refrigeration Cooling Coils
   a. Refrigerant suction and liquid connections shall be clearly labeled on outside of unit.
   b. Coils shall be proof tested to 450 psig and leak tested to 300 psig air pressure under water. After testing, insides of tubes shall be air dried, charged with dry nitrogen, and sealed to prevent contamination.
   c. Refrigerant suction and liquid headers shall be constructed of copper tubing. Suction connections shall penetrate unit casings to allow for sweat connections to refrigerant lines.
   d. Tubes shall be 1/2 inch O.D. minimum 0.016 inch minimum thick copper. Fins shall be aluminum.
   e. Coils shall have equalizing type vertical distributors sized in conjunction with capacities of coils.

D. Drain Pan
1. Drain Pan(s) shall be constructed of corrosion resistant material. Acceptable materials include polymer or 304 stainless steel. Units with cooling coils shall have drain pans under complete cooling coil section that extend beyond the air-leaving side of the coil to ensure capture of all condensate in section.
2. Drain pan manufacturer shall either insulate bottom of drain pan with closed cell foam or provide double wall internally insulated construction to eliminate bottom sweating.
3. Drain pan shall be sloped in two planes, pitched toward drain connections to ensure complete condensate drainage when unit is installed level and trapped per manufacturer's installation instructions. Units without drain pans sloped in two planes shall coat drain pans with anti-microbial treatment. Drain pan(s) shall have main and auxiliary drain connections with auxiliary outlet higher than the main connection.
4. Coil(s) shall be mounted above the drain pan to facilitate easy and complete inspection, cleaning and removal. Coil(s) may not sit in drain pan.

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5. The drain pan shall be capable of being rotated in the field between right and left hand connections.

E. Fans
1. Provide direct drive single-wheel, forward curved centrifugal fans as specified on the schedule. Fan shaft bearings shall be permanently sealed ball bearing with a minimum L50 design life of 200,000 hours.

F. Motors and Drives
1. Variable speed, multiple voltage EC motor with a plus or minus 10 percent voltage utilization range. The motor shall be open type with permanently sealed ball bearings, internal overload protection, and use a radial mount. The motor shall be factory installed, programmed, and wired to the air handler control panel.
2. Motors shall be selected to operate continuously at 130 F (55 C) ambient without tripping on overloads. Motors shall have a +/- 10 percent voltage utilization range to protect against voltage variation.

G. Filters
1. Provide removable 2” thick MERV 8 filters easily removable from either side of the unit. All units shall use standard filter sizes.

H. Electric Heat
1. Electric heating coils are factory-wired and installed one or two stage electric heating coil with over-temperature protection and magnetic contactors. Secondary manual reset backup protection provided.

I. Controls
1. DDC Controls
    a. Space Temperature Control
        1) Provide a factory installed DDC controller to reset the discharge air temperature based on space temperature and effective space temperature setpoint.
    b. Discharge Air Temperature
        1) Provide a factory installed DDC controller which maintains a discharge air temperature at a desired discharge air temperature setpoint regardless of the entering air conditions of the air handling unit.
    c. DX Cooling
        1) Provide a factory installed DDC controller to provide DX cooling control.
        2) Provide factory mounted defrost sensing device, mounted on the DX cooling coil, to indicate and help prevent frost conditions.
        3) The control package shall include the following: 24 VAC transformer, motor contactor(s), disconnect switch (except electric heat), fan status switch, filter status switch and condensate float switch.

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2.03 AIR COOLED CONDENSING (HEAT PUMP) UNITS (CU-1/2/3)

A. General
1. Provide self-contained, packaged, factory-assembled and pre-wired units suitable for outdoor use consisting of cabinet, compressor(s), condensing coil and fan(s), integral subcooling circuit(s), filter drier(s), and controls. Provide expansion valve(s) and check valves for split system heat pump unit(s).
2. Performance Ratings: Energy Efficiency Rating (EER) and Coefficient of Performance (COP) not less than prescribed by ANSI/ASHRAE 90A.

B. Casing
1. House components in 18 gauge zinc-coated galvanized steel frame and panels with weather resistant, baked enamel finish. Units surface shall be tested 500 hours in salt spray test.
2. Mount controls in weatherproof panel provided with removable panels and/or access doors with quick opening fasteners.

C. Condenser Coils
1. Heat Pump Units: Aluminum fins mechanically bonded to seamless copper tubing. Provide subcooling circuit(s). Factory leak test under water to 450 psig, and vacuum dehydrate. Seal with holding charge of nitrogen.

D. Fans and Motors
1. Vertical discharge direct driven propeller type condenser fans with fan guard on discharge. Fans shall be statically and dynamically balanced.
2. Weatherproof motors suitable for outdoor use, with permanently lubricated totally enclosed or open construction motors shall be provided and shall have built in current and thermal overload protection. Motors shall be either sleeve or ball bearing type.

E. Compressors
1. Compressors: Provide one or two (as shown on schedules) direct drive hermetic scroll compressors with integral centrifugal oil pump. Provide suction gas cooled motor with winding temperature limits and compressor overloads. Provide external high and low pressure cutout devices. Dual compressor units shall have separate and independent refrigeration circuits.
2. Provide each unit with one or two (as shown on schedules) refrigerant circuits with integral subcooling. Each circuit shall have factory-supplied filter driers, suction and liquid line service valves, all piped.
3. For heat pump units, provide reversing valve, suction line accumulator, discharge muffler, flow control check valve, and solid-state defrost control utilizing thermistors.

F. Controls
1. Provide factory-wired condensing units with 24 volt control circuit with internal fusing and control transformers, contactor pressure lugs and/or terminal block for power wiring. CONTRACTOR to provide field installed unit mounted disconnect switch. Units shall have single point power connections.
    a. Provide 24-volt, time delay relay with four minute delay between compressor staging on dual compressor units.

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b. Provide 24-volt, either 5 or 7 minute fixed-off timer that will prevent compressor short cycling upon shutdown.

2. Provide microprocessor unit-mounted DDC control which when used with an electronic zone sensor provides proportional integral room control. This UCM shall perform all unit functions by making all heating, cooling, and ventilating decisions through resident software logic.
   a. Provide factory-installed indoor evaporator defrost control to prevent compressor slugging by interrupting compressor operation.
   b. Provide an anti-cycle timing and minimum on/off between stages timing in the microprocessor.

G. Staging Controls
1. Provide NEC Class II, electronic, adjustable zone control to maintain zone temperature setting

H. Miscellaneous Features
1. Spring isolators (CU-1): Provide field-installed vibration isolators.
2. Neoprene isolators (CU-2,3): Provide field-installed rubber-in-shear isolators.
3. Low ambient control: Electronic head pressure control that allows operation to 0 degrees F outdoor ambient.
4. Condenser coil guard: Metal grille with Polyvinyl chloride coating to cover condenser coil area.

2.04 COATINGS

A. All air conditioning unit coils and copper piping inside unit cabinet shall be factory dip-coated by Bronz-Glow Technologies Inc. before installation. Color shall be platinum.

B. All air cooled condensing (heat pump) unit coils, copper piping and refrigeration components inside unit cabinet, INCLUDING the cabinet exterior, shall be factory dip-coated by Bronz-Glow Technologies Inc. before installation. Color shall be platinum.

2.05 SEQUENCE OF OPERATIONS

A. AHU-1
1. Occupied:
   a. During occupied periods, the supply fan shall run continuously and the outdoor air damper shall open to maintain minimum ventilation requirements. The DX cooling and electric heat shall stage to maintain the discharge air temperature setpoint. If economizing is enabled the outdoor air damper shall modulate to maintain the discharge air temperature setpoint. The discharge air temperature setpoint shall be dynamically reset based on the deviation of actual space temperature from the active space temperature setpoint. Discharge air temperature setpoints for heating shall be between 80.0 deg. F (adj.) and 95.0 deg. F (adj.), and for cooling shall be between 50.0 deg. F (adj.) and 68.0 deg. F (adj.). If the discharge air temperature sensor fails the DX cooling and electric heat shall stage to maintain the active space temperature setpoint and an alarm shall be annunciated at the

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thermostat. If the discharge air temperature sensor and the space temperature sensor fails the DX cooling and electric heat shall be disabled and an alarm shall be annunciated at the thermostat.

2. Unoccupied:
   a. When the space temperature is below the unoccupied heating setpoint of 60.0 deg. F (adj.) the supply fan shall start, the mixed air dampers shall remain closed and the electric heat shall be enabled. When the space temperature rises above the unoccupied heating setpoint of 60.0 deg. F (adj.) plus the unoccupied differential of 4.0 deg. F (adj.) the supply fan shall stop and the electric heat shall be disabled.
   b. When the space temperature is above the unoccupied cooling setpoint of 85.0 deg. F (adj.) the supply fan shall start, the mixed air dampers shall remain closed and the DX cooling shall be enabled. When the space temperature falls below the unoccupied cooling setpoint of 85.0 deg. F (adj.) minus the unoccupied differential of 4.0 deg. F (adj.) the supply fan shall stop, the DX cooling shall be disabled and the mixed air dampers shall close.
3. Heat/Cool Mode:
   a. When the space temperature rises above the occupied cooling setpoint of 75.0 deg. F (adj.) the mode shall transition to cooling. When the space temperature falls below the occupied heating setpoint of 72.0 deg. F (adj.) the mode shall transition to heating. When the space temperature is above the occupied cooling setpoint or below the occupied heating setpoint the mode shall remain in its last state. If the space temperature sensor fails the mode shall remain in its last state and an alarm shall be annunciated at the thermostat. If the local and communicated setpoints fail the controller shall disable the supply fan and an alarm shall be annunciated at the thermostat.
4. Mixed Air Low Limit:
   a. The initial damper opening rate shall be limited to 2% per minute (adj.) until the damper has reached its minimum ventilation position. The mixed air damper shall modulate to a position less than the minimum damper position if the mixed air temperature drops below 50.0 deg. F (adj.). If the mixed air temperature sensor fails an alarm shall be annunciated at the thermostat and the outdoor air damper shall return to the minimum position.
5. Freeze Protection:
   a. A hardwired, low limit temperature switch shall be electrically interlocked with the variable speed drive. If the low limit temperature switch is tripped 38.0 deg. F (adj.), the outdoor air damper shall close, all stages of DX cooling and electric heating shall be disabled and an alarm shall be annunciated at the thermostat. A manual reset of the low limit temperature switch shall be required to restart the fan.
6. Condensate Overflow Monitoring:
   a. If the condensate level reaches the trip point, the fan shall be disabled and the DX cooling shall be disabled.
7. Filter Status:
   a. A differential pressure switch shall monitor the differential pressure across the filter when the fan is running. If the switch closes during

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normal operation a dirty filter alarm shall be annunciated at the thermostat.

8. Duct Smoke Detectors:
    a. Duct smoke detectors shall be provided in the supply ductwork and mixing box. Upon detection of smoke from either duct smoke detector, the entire unit shall be disabled and an alarm shall be annunciated at the thermostat.

B. AHU-2/3
1. Occupied Mode:
    a. During occupied periods the supply fan shall run. The electric heating and DX cooling shall stage to maintain the active space temperature setpoint.
2. Unoccupied Mode:
    a. When the space temperature is below the unoccupied heating setpoint of 50.0 deg. F (adj.), the supply fan shall start and the electric heat shall stage on. When the space temperature rises above the unoccupied heating setpoint of 50.0 deg. F (adj.) plus the unoccupied differential of 2.0 deg. F (adj.) the supply fan shall stop and the electric heat shall stage off.
    b. When the space temperature is above the unoccupied cooling setpoint of 85.0 deg. F (adj.), the supply fan shall start, and the DX cooling shall be enabled. When the space temperature falls below the unoccupied cooling setpoint of 85.0 deg. F (adj.) minus the unoccupied differential of 4.0 deg. F (adj.) the supply fan shall stop, the DX cooling shall be disabled.
3. Space Temperature Control:
    a. Cascade zone control shall be used in the occupied modes. It maintains zone temperature by controlling the discharge air temperature to control the zone temperature while minimizing the fan speed.
    b. The space temperature shall be maintained between the occupied cooling setpoint of 75.0 deg. F (adj.) and the occupied heating setpoint of 60.0 deg. F (adj.). The unit shall transition to the cooling mode when the space temperature rises one degree above the occupied cooling setpoint. The unit shall transition to the heating mode when the space temperature drops one degree below the occupied heating setpoint.
4. Supply Fan Operation:
    a. The supply fan shall cycle on demand during the unoccupied mode. When the controller is in the occupied mode, the supply fan shall operate continuously at the lowest minimum speed required to maintain space temperature. The supply fan status shall be monitored by the ECM motor controller. If the supply fan fails the fan shall be commanded off and an alarm shall be annunciated at the thermostat. A manual reset shall be required to restart the fan.
5. Condensate Overflow Monitoring:
    a. If the condensate level reaches the trip point, the fan shall be disabled and the DX cooling shall be disabled.
6. Filter Timer:
    a. The fan-run time (hrs) shall be compared to the filter maintenance timer setpoint. Once the setpoint is reached a filter timer alarm diagnostic

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shall be annunciated at the thermostat. When the diagnostic is cleared, the filter-maintenance timer is reset to zero, and the timer begins accumulating fan-run time again.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Air conditioning units and air cooled condensers shall be installed, connected and placed in satisfactory working order in accordance with the manufacturer's instructions and details, approved shop drawings, and the Contract Drawings.

3.02 IDENTIFICATION

A. Each unit of equipment shall be identified with the equipment item numbers given on the Contract Drawings. A corrosion-resistant stainless steel tag or nameplate, securely affixed in a conspicuous place on each unit shall give the equipment item number, manufacturer's name or trademark and such other information as the manufacturer may consider necessary, or as specified, to complete identification.

3.03 TESTING

A. Motor tests in accordance with Specification 16150 - Electric Motors.

B. Field tests shall be performed in accordance with Division 1, and Specification 15951 – Testing, Adjusting and Balancing.

3.04 MANUFACTURER'S REPRESENTATIVE

A. The CONTRACTOR shall provide the services of a qualified manufacturer's technical representative who shall adequately supervise the installation and testing of all equipment furnished under this Contract. The services of the manufacturer's representative shall be provided for a period of not less than 3 days as follows:
   1. At least 1 trip of up to 1 day during installation of the equipment.
   2. One trip of up to 1 day after acceptance of the equipment.
   3. One trip of 1 day for training and troubleshooting.

   Travel to and from site will not be included in determining the above time.

B. Any additional time required to achieve successful installation and operation shall be at the expense of the CONTRACTOR.

END OF SECTION 15750

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SPECIFICATION 15810

DUCTWORK AND DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install all ductwork complete with auxiliary equipment and accessories as shown, specified and/or required for proper operation.

1.02 RELATED SPECIFICATIONS

A. Specification 09900 - Painting.

B. Specification 15951 - Testing, Adjusting and Balancing.

1.03 PAYMENT

A. Payment for work furnished and installed under this Section shall be as specified in the Specification.

1.04 REFERENCES

A. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified. General requirements of this Contract shall supersede the Standards in case of conflict:

1. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).

2. Sheet Metal and Air Conditioning Contractors National Association (SMACNA).

a. HVAC Duct Construction Standards.

b. Seismic Restraint Manual - Guidelines for Mechanical Systems.

3. ASTM A 774 - As-Welded Wrought Austenitic Stainless Steel Fittings for General Corrosive Service at Low and Moderate Temperatures.

4. ASTM A 778 - Welded, Unannealed Austenitic Stainless Steel Tubular Products.

5. NFPA 91 - Blowers and Exhaust Systems for Dust, Stock and Vapor Removal or Conveying.

6. UL 555 - Fire Dampers.

7. UL 181 - Factory Made Air Ducts and Connectors.

8. UL 214 - Tests for Flame Propagation of Fabrics and Films.

9. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.

B. Field Measurements: Take field measurements where required prior to installation to ensure proper fitting of Work.

C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 SUBMITTALS

A. Contractor shall submit working drawings, shop drawings and material specifications for the approval of the Engineer in accordance with the requirements of Division 1 of the Specifications. Working drawings and shop drawings shall include, but not limited to:

1. 1/4-inch scale duct layouts.

2. Dimensions.

3. Details of construction.

4. Details of installation, hanger details and spacing.

5. Manufacturer's literature, illustrations, specifications and Engineering data.

6. Registers.=

7. Flexible connections.

8. Other technical data related to the specified material and equipment as requested by Engineer.

9. Duct sealants.

10. Air outlet schedule indicating room name and location of each outlet. Cross reference contract designation and manufacturer's model number or name.

B. Test Reports: Submit the following test reports for approval where required.

1. Control Damper leakage tests from an AMCA approved testing laboratory.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Engage a single firm, with undivided responsibility for performance and other requirements and components of the ductwork.

2. Engage a firm which can show successful experience in the fabrication and erection for ductwork systems of scope and type similar to the required Work.

B. Installer Qualifications:

1. Contractor shall have at least 5 years' experience in the installation of the Work specified. He shall employ only tradesmen with specific skills and experience in this type of Work.

2. Contractor shall have undivided responsibility as a single firm for performance and other requirements for the installation of the Work specified herein.

C. Requirements of Regulatory Agencies: Comply with applicable provisions of regulatory agencies below and others having jurisdiction.

1. Underwriters Laboratories, Incorporated (UL)

2. National Fire Protection Association (NFPA).

3. National Electrical Code.

4. Local and State Building Codes and Ordinances:

a. International Fire Prevention and Building Code.

b. International Building Code (IBC) Latest Edition, Section 1621

c. ASCE 7, Latest Edition, Section 9.61

5. Permits: Contractor shall obtain and pay for all required permits, fees and inspections.

PART 2 PRODUCTS

2.01 MATERIALS

A. Metal Ductwork:

1. Galvanized Steel (G90 Coating)

a. Air devices for galvanized ductwork shall be aluminum.

2. Aluminum (with 3003 ductwork H-14 alloy and temper)

a. Air devices and ductwork accessories for aluminum ductwork shall be aluminum.

2.02 METAL DUCTWORK

A. General:

1. All work shall be constructed and installed properly in accordance with the recommendations given in the latest edition of the Sheet Metal & Air Conditioning Contractors National Association (SMACNA) HVAC Duct Construction Standards and Rectangular Industrial Duct Construction Standards. All ductwork shall be constructed in accordance with the Schedule of Duct Construction Standards listed on the last page of this section.

2. All ducts shall conform accurately to the dimensions indicated on the Contract Drawings, shall be straight and smooth on the inside with neatly finished joints, and shall not be decreased at any point to avoid obstructions. No piping, conduit or structural work shall be installed in or through any ductwork. All ductwork shall be run as close as possible to structural members, walls and ceilings. Ductwork shall be as shown on the contract drawings, subject to such modifications as may be necessary to suit field conditions to clear any obstruction or conflicts with other equipment.

3. All longitudinal seams shall be Pittsburgh Z.

B. Galvanized Steel Ductwork

1. All ductwork shall be fabricated of galvanized steel or as otherwise called for. Complying with A527 lock forming quality with ASTM A525 G90 zinc coating, milling phosphatized. Cross breaking shall not be used on ductwork which is to be finished with rigid insulation. Ductwork passing through or coming in contact with concrete or masonry shall receive a heavy coat of bituminous paint prior to installation of the ductwork. Transverse duct connection shall be bolted, gasketed connections such as Ductmate 35 System as manufactured by Duct Mate Industries, SMACNA T-25a/b Type, or approved equal.

2. Schedule

a. All ductwork shall be fabricated and installed in accordance with the schedule listed at the end of this section of specification.

b. All air outlets for galvanized steel ductwork shall be aluminum.

2.03 DUCTWORK ACCESSORIES

A. Hangers and Supports:

1. All ductwork shall be securely hung and anchored to the building structure. Unless otherwise shown or specified, hangers and stiffeners for ducts shall conform with the recommendations given in the SMACNA HVAC Duct Construction standards and SMACNA seismic restraint manual. Ducts

shall be supported on trapeze hangers with angles or rods. Use of strap hangers and straps is prohibited.

2. All ductwork shall be supported from trapeze type hangers. Hanger rods shall be minimum 3/8 inch for all ducts with half perimeter up to 72 inches, and ½ inch diameter for all ducts with half perimeter larger than 72 inches. A pair of rods shall be provided at each duct support point. Maximum hanger spacing shall be 8 feet for ducts with half perimeter up to 72 inches and 6 feet for ducts with half perimeter larger than 72 inches.

3. Hanger Construction and installation shall conform to SMACNA Standards, except as specified. No sheet metal duct hangers or straps will be allowed.

4. Support shall be furnished at each fitting.

5. Contractor shall provide all miscellaneous steel necessary to support ductwork from structural elements.

6. Conform to all requirements of Specification 15060 - Hangers and Supports.

B. Sleeves: Where ductwork passes through masonry walls, partitions or floors provide minimum 16 gauge sleeves. Caulk airtight with fire resistant sealant between sleeve and ductwork.

1. Materials shall be as follows:

a. Galvanized steel for galvanized steel and aluminum ductwork.

C. Access Doors:

1. Reference: SMACNA Standards.

2. Type: Gasketed cam lock covers.

3. Materials: Same as duct.

4. Unless otherwise specified access doors shall be:

a. 12 by 6 inches for ducts sizes 12-inches and smaller.

b. 12 by 12-inches for ducts size 14-inches.

c. 21 by 14-inches for ducts between 14 and 36 inches.

d. 25 by 17 inches for ducts between 36 and 60 inches.

e. Two 25 by 17 inch doors for ducts larger than 61 inches.

5. Access doors for fire dampers shall be stenciled "FIRE DAMPER ACCESS" with minimum ½-inch high letters.

D. Flexible Connections:

1. Reference: SMACNA Standards for pressure classification of 3 inches water gage.

2. Manufacturer: Provide flexible connections manufactured by one of the following:

a. DuroDyne Corp.

b. Ductmate Industries, Inc.

c. C.L. Ward.

d. Elgen Manuf., Inc.

e. Hardcast Carlisle.

f. Or approved equal.

3. Fabric Materials: Flame-retardant or noncombustible fabrics.

4. Coatings and Adhesives: Comply with UL 181, Class 1.

5. Metal-Edged Connectors:

a. Metal-Edged Connectors: Factory fabricated with a fabric strip 6” wide attached to two strips of 3” wide 24 gage galvanized sheet steel for galvanized steel ductwork.

6. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

a. Minimum Weight: 26 oz./sq. yd..

b. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.

c. Service Temperature: Minus 40 to plus 200 deg F.

E. Turning Vanes:

1. Reference: SMACNA.

2. Construction: Same Material as ductwork.

3. Vanes: Double thickness

F. Gravity Backdraft Dampers:

1. Construction:

a. Multiple, interlocked blades mounted in frame.

b. Felt gasketed blade edges.

c. Stainless steel or brass bearings.

d. Tie rod connecting each blade.

e. Counterweights or adjustable spring attached to tie rods.

f. Capable of horizontal or vertical operation.

g. Metal frame.

2. Materials:

a. Same material as ductwork.

b. Tie Rod: Aluminum 0.081 gage.

c. Louver Arm: Aluminum 0.081 gage.

d. Bumpers: Waterproof felt.

3. Leakage:

a. Dampers with dimensions 24” or larger shall be certified that leakage does not exceed 20 CFM per square foot with 1 inches of static pressure across damper.

b. Dampers with dimensions less than 24” shall be certified that leakage does not exceed 40 CFM per square foot with 1 inches of static pressure across damper.

G. Hardware:

1. Materials:

a. All fastening devices used for galvanized steel and aluminum ductwork shall be galvanized steel.

2. All gasketing material shall be butyl.

H. Bird Screens and Frames:

1. Materials:

a. Aluminum: Bird screens shall conform to ASTM E 437, Type I, Class 1, 2 by 2 mesh, [0.031 inch diameter aluminum wire]. Frames shall be removable type aluminum construction.

2.04 REGISTERS, GRILLES AND DIFFUSERS

A. Manufacturer: Provide equipment as manufactured by one of the following:

1. Price Industries.

2. AJ Manufacturing Company.

3. Carnes.

4. Tuttle & Bailey.

5. Titus.

6. Or approved equal.

B. General:

1. Materials:

a. Units shall be factory-fabricated of aluminum construction when installed in aluminum and galvanized steel ductwork, and shall distribute the specified of air volume (cubic feet per minute).

2. Outlets for diffusion, spread, throw, and noise level shall be as required for specified performance. Performance shall be certified according to ASHRAE 70. Inlets and outlets shall be sound rated and certified according to ASHRAE 70.

3. Registers shall be provided with volume damper with accessible operator, unless otherwise indicated; or if standard with the manufacturer, an automatically controlled device will be acceptable. Volume dampers shall be opposed blade type for all registers.

4. Where the inlet and outlet openings are located less than 7 feet above the floor, they shall be protected by a grille or screen according to NFPA 90A.

5. Registers:

a. Units shall be four-way directional-control type, except that return and exhaust registers may be fixed horizontal or vertical louver type similar in appearance to the supply register face.

b. Registers shall be provided with sponge-rubber gasket between flanges and wall or ceiling.

c. Grilles shall be as specified for registers, without volume control damper.

6. An additional volume damper shall be installed in duct stub to each air outlet for balancing of air volume.

C. Exhaust and return registers shall be complete with fixed horizontal face bars with 3/4” blade spacing, set straight, and a key operated opposed blade damper.

1. Return and exhaust registers and damper installed in aluminum or galvanized ductwork shall be of aluminum construction with opposed blade aluminum damper. Supply registers shall be Price Industries Model 610ZDAL, or approved equal.

2.05 CONTROL DAMPERS

A. Air control dampers shall be of the low leakage type complete with channel frame, air foil blades and baffles, inflatable fabric reinforced neoprene rubber blade edge seal, spring loaded side seals, open/close limit switches, and, where required, extended axles. Parallel blade action shall be provided for two position applications. Opposed blade action shall be provided for modulating application. Dampers shall be certified that leakage does not exceed 3 CFM per square foot with 1 inches of static pressure across damper. Dampers shall have stainless steel pins and nylon bushing.

B. For motorized dampers, provide quantities and sizes of actuators as required for damper sizes shown on Contract Drawings.

C. Materials:

1. Dampers installed in galvanized or aluminum ductwork shall be of extruded aluminum construction and shall be Ruskin Manufacturing Model CD50, or approved equal.

2.06 HURRICANE (MIAMI-DADE QUALIFIED) WIND-DRIVEN-RAIN-RESISTANT LOUVERS:

A. Louver Depth: 6 inches.

B. Frame and Blade Nominal Thickness: Not less than 0.063 inch for blades and 0.081 inch for frames.

C. Materials:

1. Extruded aluminum frame and blades, 6063-T5 grade.

D. Louver Performance Ratings:

1. Wind Load: Designed to withstand a wind load of 130 PSF.

2. Free Area: Not less than 7.58 sq. ft. for 48-inch-wide by 48-inch-high louver.

3. Air Performance: Not more than 0.10-inch wg static pressure drop at 743-fpm free-area intake velocity.

4. Wind-Driven Rain Performance: Not less than 100 percent effectiveness when subjected to a rainfall rate of 8 inches per hour and a wind speed of 50 mph at a core-area intake velocity of 718 fpm.

5. Beginning Point of Water Penetration: Above 1,250 FPM free area velocity.

E. Finish:

1. 4-coat 70% Kynar 500/Hylar 5000 AAMA 2605, 1.2 mil dry film thickness.

F. Warranty:

1. 5 years factory product warranty

2. 20 years factory finish warranty.

G. Accessories:

1. Insect screen at exterior face of louver, aluminum, 18 x 16 mesh, 0.012” wire.

2. Clip angles.

3. Flanged frame.

4. Mounting angles

5. Extended sill

H. Certifications:

1. AMCA Listed: Licensed to bear the AMCA Certified Ratings Seal for AMCA 500-L, AMCA 540 (Basic Protection, Missile Level D and Enhanced Protection, Missile Level E) and AMCA 550.

2. Florida Test Protocols: Tested and qualified per TAS 201 (Large Missile Impact), TAS 202 (Uniform Static Air Pressure) and TAS 203 (Cyclic Wind Loading).

I. Hurricane (Miami-Dade Qualified) Wind Driven Rain Resistant Louvers shall be Greenheck Model EHH-601DE or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Turning vanes shall be installed in all miter elbows to permit air to make the abrupt turns with a minimum of turbulence. The turning vanes shall be quiet and free from vibration when the system is in operation. Turning vanes shall be double thickness type. Vanes shall be installed in all short radius elbows in accordance with SMACNA standards and Industrial Duct Construction standards. Duct clean out doors shall be provided at each elbow with turning vanes.

B. Duct access doors shall be provided within working distance of, and on the fusible link side of all fire dampers, adjacent to volume dampers, on the linkage side of automatic dampers and at all other apparatus requiring service or inspection in the duct system. The doors shall be rigid and airtight, and provided with neoprene gaskets, hinges and sash locks. Whenever space requirements are such that a hinged access door is impractical, a screw fastened lift-out door shall be provided instead.

C. Flexible connections for preventing the transmission of vibrations through the ductwork to the structure shall be installed between the ductwork and all air moving equipment and at the building joints. Flexible connections shall be neoprene-impregnated fabric collars with cemented seams fastened with straps and bolts of the same material as the ductwork. Flexible connections shall not be painted or used to correct misalignment.

D. Contractor shall furnish and install sleeves for dampers mounted in the masonry, concrete plenums or shafts. Sleeves shall be 16 gage and shall match the attached ductwork.

E. After the installation is completed, the Contractor shall seal all joints air tight. Sealants and tape shall have a flame spread not greater than 25 and a smoke developed rating of not over 50.

F. All ductwork shall conform accurately to the dimensions shown, the ducts shall be straight and smooth inside with joints neatly finished; ductwork shall be installed so as to preclude the possibility of vibration under all operating conditions.

G. Tape and seal all joints as per SMACNA Standards.

H. Elbows shall have a minimum centerline radius of 1-1/2 times the width of the duct. Turning vanes shall be provided at all square elbows. Turning vanes shall be double wall and shall be quiet and free from vibration when the system is in operation.

I. Provide flexible connections at inlet and discharge of an inline fan.

J. Provide access doors for all dampers for inspection and maintenance.

K. Install all ductwork and accessories to provide a system free from buckling, warping, breathing or vibration.

L. All ducts at flexible connections with air handling equipment, and fans shall be supported at free end within 12 inches of flexible connection.

M. Provisions shall be made for supporting all ductwork, dampers, and other ductwork accessories, where necessary.

N. Coordinate all air outlets for compatibility with ceiling system.

O. All ductwork shall arrive on site fully fabricated, not in two halves for field fabricated.

3.02 ADJUSTMENT

A. Verify that dampers are in open position.

B. Start fan system and check for excessive leaks and vibration and correct.

3.03 BALANCING

A. Systems shall be completely tested, adjusted and balanced by a qualified engineer. A complete balancing procedure shall be submitted for approval. All equipment and connections required to balance the systems shall be provided.

B. All duct systems shall be balanced as specified in Specification 15951 - Testing, Adjusting and Balancing.

3.04 CLEANING

A. Remove all loose materials and obstructions from interior of ducts.

B. Remove debris and waste materials resulting from installation.

3.05 PAINTING

A. Surface Preparation and Shop Painting:

1. Clean and prime coat ferrous metal surfaces of equipment in the factory/shop in accordance with the requirements of Specification 09900.

2. Coat polished and non-ferrous metal surfaces with corrosion prevention compound which shall be maintained during storage and until equipment begins operations.

B. Field Painting: Painting required for exterior surfaces of ductwork and insulation, and finish painting of items only primed at the factory, are specified in Specification 09900, Painting.

3.06 CONSTRUCTION AND MATERIAL SCHEDULE

A. Schedule of Metal Duct Construction Standards:

Schedule of Duct Construction Standards		
Service	**Pressure Classification**	**Construction Standards**
All ductwork on fan discharge side	3" W.G. POS.	SMACNA HVAC Duct Construction Standards
All ductwork on fan suction side	3" W.G. NEG.	SMACNA HVAC Duct Construction Standards
Transfer air duct not connected to fan	2" W.G. POS. or NEG.	SMACNA HVAC Duct Construction Standards

1. Notes:

    a. All accessories, including but not limited to, turning vanes, air turning devices, manual volume dampers, motor operated control dampers, fire dampers, access doors, supports, angles, clamps, hangers and hardware, shall be the same material as the associated ductwork and suitable for the pressure classification given above.

B. Ductwork Material Schedule:

1. Galvanized Steel (G90 Coating) to be used for louver sleeves.

2. Aluminium for restroom

C. Ductwork Seal Class and Leakage Class Schedule:

1. All ductwork: Seal Class A, Leakage Class 4.

END OF SECTION 15810

SPECIFICATION 15815

DUCT INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install all duct insulation complete with auxiliary equipment and accessories as shown, specified and/or required for proper operation.

1.02 RELATED SPECIFICATIONS

A. Specification 07900 - Caulking and Sealants

B. Specification 09900 - Painting

C. Specification 15060 - Hangers and Supports - HVAC

D. Specification 15076 - Piping and Equipment Identification

E. Specification 15810 - Ductwork and Duct Accessories

1.03 REFERENCES

A. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified. General Requirements of this Contract shall supersede the Standards in case of conflict:
   1. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)
   2. ASTM E 84 - Surface Burning Characteristics of Building Materials
   3. NFPA 255 - Surface Burning Characteristics of Building Materials
   4. UL 723 - Test for Surface Burning Characteristics of Building Materials
   5. NFPA 90A - Installation of Air Conditioning and Ventilating Systems
   6. ASTM C 449 - Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement
   7. ASTM C 534 - Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form
   8. ASTM C 547 - Mineral Fiber Pipe Insulation
   9. ASTM C 552 - Cellular Glass Thermal Insulation
   10. ASTM C 553 - Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
   11. ASTM C 612 - Mineral Fiber Block and Board Thermal Insulation
   12. ASTM C 647 - Properties and Tests of Mastics and Coating Finishes for Thermal Insulation
   13. ASTM C 916 - Adhesives for Duct Thermal Insulation
   14. ASTM C 920 - Elastomeric Joint Sealants
   15. ASTM C 1126 - Specification for Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation

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B. Field Measurements: Take field measurements where required prior to installation to ensure proper fitting of Work.

C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.04 SUBMITTALS

A. CONTRACTOR shall submit working drawings, shop drawings and material specifications for the approval of the Engineer in accordance with the requirements of Section 01300.

B. Samples: Submit for approval samples of the following:
   1. Thermal Insulation - Flexible.
   2. Thermal Insulation - Rigid.
   3. Acoustical Insulation.

C. Shop Drawings: Submit for approval manufacturer's catalog literature, specifications and illustrations with the following information:
   1. Thermal properties
   2. Physical properties
   3. Fire hazard ratings
   4. Facing information
   5. Installation instructions
   6. Jointing recommendations for butt joints and longitudinal seams

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Engage a single firm, with undivided responsibility for performance and other requirements and components of the duct insulation installation.
   2. Engage a firm which can show successful experience in the manufacture of duct insulation systems of scope and type similar to the required Work.

B. CONTRACTOR's Qualifications:
   1. CONTRACTOR shall have at least 5 years' experience in the installation of the Work specified. He shall employ only tradesmen with specific skills and experience in this type of Work.
   2. CONTRACTOR shall have undivided responsibility as a single firm for performance and other requirements for the installation of the Work specified herein.

C. Requirements of Regulatory Agencies: Comply with applicable provisions of regulatory agencies below and others having jurisdiction.
   1. Underwriters Laboratories, Incorporated (UL).
   2. National Fire Protection Association (NFPA).
   3. Local and State Building Codes and Ordinances.
      a. International Building Code
      b. International Fire Code
      c. International Energy Conservation Code

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D. General: Insulation systems including covering, mastics, adhesives, sealers and facings shall have the following Fire Hazard Classifications in accordance with ASTM E 84:
   1. Flame spread, 25 maximum.
   2. Fuel contributed, 50 maximum.
   3. Smoke developed, 50 maximum.

E. Source Quality Control: Perform the following tests and inspections at factory.
   1. Flame Spread
   2. Smoke Developed
   3. Fuel Contributed

F. Manufacturer's Markings:
   1. Stamp or label with manufacturer's name and brand every package or standard container of covering, adhesive and coating delivered to the job site for use.
   2. Exposed side of insulation shall be legibly labeled by the manufacturer to show thickness, type and manufacturer.

1.06 JOB CONDITIONS

A. Sequencing: Obtain the Engineer's approval of insulation, adhesives, coatings and method of installation before installing any insulation.

B. All duct leaks shall be sealed prior to installation of external insulation to prevent billowing and damage to insulation.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Manufacturer: Provide insulation of one of the following:
   1. Owens Corning.
   2. CertainTeed Corporation.
   3. Johns-Manville Corporation.
   4. Or approved equal.

B. Exposed Ductwork Insulation (Rigid): All exposed ductwork as listed under Paragraph 3.05 - Schedules, shall be insulated with minimum 1-1/2" thick (except 2 inches thick for ducts located outdoor and outside air intake plenums) glass fiber board having a density of not less than 3.0 lbs./cu.ft., and a thermal conductivity of not more than 0.23 BTU-inch/hour square feet °F at 75°F mean temperature. The insulation shall be Johns-Manville No. 814 Spin - Glas, Certain Teed Corporation Industrial Board, or approved equal. The insulation shall be impaled over pins welded to the duct surface on 12" centers. The pins shall be coated with vapor barrier adhesive, and the insulation shall then be secured with caps over the pins. All joints and breaks in the vapor barrier shall be sealed with 3" wide strips of the vapor barrier facing. All insulation shall be reinforced with corner bead. The facing shall be finished with a 3-ply

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application of lagging adhesive, glass fabric reinforcing and a finish coat of mastic.

C. Concealed Ductwork Insulation (Flexible): All concealed ductwork as listed under Article 3.05 - Schedules, shall be insulated with 1-1/2" thick flexible fiberglass duct insulation, having a thermal conductivity of not more than 0.28 BTU-inch/hour square feet °F at 75°F mean temperature. The insulation shall have a reinforced foil vapor barrier facing. Insulation shall be secured with 4" wide bands of adhesive on 12" centers. All joints shall be sealed by adhering a 2" sealing lap or 3" strips of vapor barrier facing applied with vapor barrier adhesive. On horizontal ducts over 24" wide, welded pins and clips shall be used on the underside on 18" centers.

D. Internal Duct Liner Insulation - Acoustical Insulation:
   1. Type: Fiberglass duct liner board with black surface.
   2. Density: Minimum 1-1/2 lbs. per cubic foot.
   3. Thickness: 1-1/2 inch minimum.
   4. Thermal Conductivity: 0.23 Btu-Inch/hr. ft2. °F @ 75°F mean temperature.

E. Adhesives and Accessories:
   1. Acoustical Lining Insulation Adhesive: Insulation shall be applied in cut-to-size pieces attached to the interior of the duct with a nonflammable, fire-resistant adhesive conforming to ASTM C 916, Type I. Exposed edges of the liner at the duct ends and at other joints where the lining will be subject to erosion shall be coated with a heavy brush coat of the nonflammable, fire-resistant adhesive to prevent delamination of glass fibers.
   2. Mineral Fiber Insulation Cement: Cement shall be in accordance with ASTM C 195.
   3. Lagging Adhesive: Lagging adhesives shall be nonflammable and fire-resistant and shall have flame spread and smoke developed ratings of 25/50 when measured in accordance with ASTM E 84.
   4. Contact Adhesive: Adhesive may be dispersed in a non-halogenated organic solvent with a low flash point (flash pint less than minus 25°F when tested in accordance with ASM D 3278) or, dispersed in a nonflammable organic solvent which shall not have a fire point below 200°F. The adhesive shall be nonflammable and fire resistant.
   5. Caulking: Caulking shall be in accordance with ASTM C 920.
   6. Corner Angles: Nominal 0.016 inch type 316 stainless steel 1 x 1 inch with factory applied kraft backing and adhesive.
   7. Finishing Cement: Mineral fiber hydraulic-setting thermal insulating cement ASTM C 449.
   8. Fibrous Glass Cloth and Glass Tape: Fibrous glass cloth and glass tape shall have flame spread and smoke developed ratings of no greater than 25/50 when measured in accordance with ASTM E 84.
   9. Staples shall be outward clinching Type 316 stainless steel.
   10. White Vapor Retarder ASJ (All Service Jacket): For use on hot/cold pipes, ducts, or equipment. Vapor retarder jackets used on insulation exposed in finished areas shall have white finish suitable for painting.

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PART 3 - EXECUTION

3.01 INSPECTION

A. Ensure that all surfaces are clean and dry before applying insulation.

3.02 PREPARATION

A. Ensure that ductwork has been inspected and released for application of insulation.

3.03 INSTALLATION

A. Install insulation so as to make surfaces smooth, even and substantially flush with adjacent duct insulation.

B. Follow manufacturer's application instructions for all materials used.

C. Duct sizes indicated on Drawings are clear inside dimensions. Increase duct sizes to give designated inside dimensions when internal insulation is used.

D. Thickness of rigid insulation shall be greater than the seams or angles of ductwork to which it is applied.

E. Duct insulation shall be continuous through sleeves and prepared openings.

F. Insulation shall terminate at fire dampers and flexible connections.

G. Vapor barrier materials shall be applied to form a complete unbroken vapor seal over insulation.

H. Provide Type 316 stainless steel jacketing and waterproof sealants for insulated ducts exposed to outdoor.

I. Field painting shall comply with the requirements of Specification 09900, Painting.

J. Identification markers and labels shall be in conformance with Specification 15076 - Piping and Equipment Identification.

3.04 CLEANING

A. Remove all debris, waste materials and loose foreign matter resulting from installation.

3.05 SCHEDULES

A. Thermal Insulation - Rigid: The following exposed ductwork exposed in room shall be insulated:

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1. All outside air intake ducts and plenums from the outside air intake louver, outside air intake shaft, or roof mounted intake up to the point where the duct or plenum is connected to the heating and ventilating units, air conditioning units, or supply fans in heated and air conditioned spaces.
2. All exhaust and return air ductwork from air conditioned spaces.
3. All supply and return air ductwork associated with air conditioning units.
4. All heated and air conditioned ductwork located in unheated spaces.
5. All heated and air conditioned ductwork located outdoor shall be insulated and covered with weatherproof stainless steel jacket.
6. Where indicated on the Contract Drawings.

B. Thermal Insulation - Flexible: The following ductwork located above hung ceiling shall be insulated:
   1. All supply, exhaust and return ductwork associated with air conditioning units.
   2. All outside air intake ducts and plenums from the outside air intake louver, outside air intake shaft or roof mounted intake up to the point where the duct or plenum is connected to the heating and ventilating units and supply fans.
   3. Where indicated on the Contract Drawings.

C. Acoustical Insulation: Ductwork shall be internally insulated as specified in Specifications and where indicated on the Contract Drawings.

D. Insulation Thickness: All ductwork insulation shall be 1-1/2-inch thick (R-8 min.) except for outside air intake plenum and outside air ductwork insulation which shall be 2 inches thick (R-12 min.).

END OF SECTION 15815

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SPECIFICATION 15830

FANS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The Contractor shall provide all labor, materials, equipment and incidentals to furnish and install all fans in accordance with the requirements specified herein as shown on the Contract Drawings or specified in the Specifications.

B. The equipment shall be furnished complete with all accessories, special tools, spare parts, base attachments, mountings, anchor bolts and other appurtenances as specified or as may be required for a satisfactory installation.

C. All fans shall be furnished in accordance with the schedule shown on the Contract Drawings.

1.02 RELATED SPECIFICATIONS

A. Specification 09900 - Painting

B. Specification 15071 - Vibration and Wind Control

C. Specification 15076 - Piping & Equipment Identification

D. Specification 15951 - Testing, Adjusting and Balancing

1.03 PAYMENT

A. Payment for work furnished and installed under this Section shall be as specified in the Specifications.

1.04 REFERENCES

A. Equipment shall comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

1. American Society of Mechanical Engineers (ASME)
2. American Society of Testing Materials (ASTM)
3. Air Movement and Control Association (AMCA)
4. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
5. National Fire Protection Association (NFPA)
6. National Electric Code (NEC)
7. Applicable Federal, State and local laws and/or ordinances

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B. Where conflict arises between the local codes and the requirements of the National Electrical Code, The National Fire Code, NEMA, ASTM, etc., the more stringent requirements shall prevail.

1.05 SUBMITTALS

A. In accordance with the procedures and requirements set forth in Division 1 of the Specifications, the Contractor shall obtain from the equipment manufacturer and submit the following:

1. Shop Drawings

2. Preliminary Operation and Maintenance Manuals

3. Final Operation and Maintenance Manuals

4. Spare Parts List

5. Special Tools List

6. Reports of Certified Shop Tests

7. AMCA Approval for Fan Ratings

B. Shop Drawings

1. Shop drawings shall include but not be limited to:

a. Equipment specifications and data sheets identifying all materials used and methods of fabrication.

b. Complete assembly, layout, installation and foundation drawings with clearly marked dimensions.

c. Fan performance curve indicating the operating point.

d. Details of corrosion resistance coating.

e. Motor nameplate data as specified in Specification 15058 - Common Motor Requirements for HVAC Equipment.

f. Detailed specifications and data sheets for all accessories such as roof curbs, dampers, damper operators disconnect switches, vibration isolators etc.

g. Example equipment nameplate data sheet.

h. Interconnecting wiring diagrams.

i. List of recommended lubricants.

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C. Operations And Maintenance Manuals

1. The Contractor shall submit operation and maintenance manuals in accordance with the procedures and requirements set forth in Division 1 of the Specifications.

2. Two copies of a preliminary O&M manual shall be included in the shop drawing submittal. Without inclusion of these manuals, the submittal will be considered incomplete and will be returned without review.

D. Lubricants: The manufacturer shall submit a list with a minimum of four (4) manufacturers standard lubricants which may be used interchangeably for each type of lubricant required. The Contractor shall utilize this list in preparing his comprehensive lubrication survey as specified in Division 1 of the Specifications.

1.06 QUALITY ASSURANCE AND QUALIFICATIONS

A. The equipment covered by these specifications is intended to be standard equipment of proven performance as manufactured by reputable concerns. Equipment shall be designed, constructed and installed in accordance with the best practices of the trade, and shall operate satisfactorily when installed as shown on the Contract Drawings.

B. It is the intent of these specifications that all components of the fans be provided by the Contractor through one vendor. The Contractor through the vendor shall have the sole responsibility of matching all components and providing equipment which functions together as a system.

1.07 SPARE PARTS AND SUPPLIES

A. Furnish all special tools necessary to dis-assemble, service, repair and adjust the equipment.

B. The following spare parts shall be furnished for up to every four (4) same size of fan:

1. one (1) blower with wheel

2. one (1) set bearing and seal

3. one (1) set sheave

4. one (1) shaft

5. two (2) sets of belts for each belt driven fan

C. Furnish all additional spare parts as recommended by the equipment manufacturers.

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D. Spare parts lists, included with the shop drawing submittal shall indicate specific sizes, quantities, and part numbers of the items to be furnished. Terms such as "1 lot of packing material" are not acceptable.

E. Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. Each part shall be properly identified by a separate number. Those parts which are identical for more than one size, shall have the same parts number.

PART 2 PRODUCTS

2.01 FANS - CONDITION OF SERVICE AND DESIGN DATA

A. Fans shall be as specified below and shown on the Contract Drawings. The Contractor shall include, as part of this work, all supports required. The fans shall be installed where indicated on the Contract Drawings.

B. Performance data for all fans shall be based on tests conducted in accordance with the "Standard Test Code for Centrifugal and Axial Fans" as adopted by the Air Movement and Control Association (AMCA) and shall be licensed to bear the AMCA certified rating seal for both sound and air performance. All fans shall be selected from performance curves and not from rating tables. A copy of the curve, indicating the operating point, shall be submitted for each proposed fan.

C. Unless otherwise indicated, motors shall be of the totally enclosed premium efficiency type. Motors shall not be selected for operation in the service factor range/zone. The maximum brake horsepower required at any point on the performance curve shall not exceed the rated horsepower of the motor.

D. Motors 1/3 HP and less shall be suitable for use with 115V, single phase, 60 Hz electric service. Motors 1/2 HP or larger shall be for use with 460V, three phase, 60 Hz electric service, unless otherwise indicated. Two speed motors shall be two winding type. Motors shall comply with the requirements of Specification 15058.

E. All fans and damper operators shall each be provided with individual externally mounted disconnect switches. All enclosures shall be NEMA 4X stainless steel unless otherwise specified.

F. All dampers for roof mounted fans shall be mounted in the mounting pedestal with removable access panel for inspection and servicing of damper and operator. Mounting pedestal shall provide solid ventilator support and a weather tight seal.

G. All fans shall be statically and dynamically balanced at the speed at which the unit is scheduled to operate. Fans with corrosion resistant coatings shall be balanced after being coated.

H. The fans shall be either direct connected or V belt drive as indicated on the schedule. For motors less than or equal to 10 HP, the V belt drive shall be selected for 120 percent of rated capacity. For motors larger than 10 HP, the V

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belt drive shall be selected for 150 percent of rated capacity. All V belt drives shall be provided with adjustable sheaves. Exposed V-belt drives shall have removable belt guards with openings to allow for tachometer readings at both drive and fan shafts. Guards shall be so constructed as to allow visual inspection of the belts without removing the guard.

I. Vibration isolators shall be provided in conformance with Specification 15071. Isolators shall have a minimum efficiency of 90 percent. Installation, type, number, and size of isolators shall be in conformance with the manufacturer's recommendations for the frequencies involved.

J. All fan bearings shall be selected for a minimum L-50 life of 100,000 hours at maximum operating speed.

K. All fans shall be provided (inside and outside) with baked on Heresite P-413 corrosion resistant coating including all accessories but not limited to the housing, wheels, curbs, liners, dampers, damper access sections.

L. All fan motors shall be provided with high premium energy efficient totally enclosed fan cooled type. .

M. All shafts shall be sized so the first critical speed is at least 20 percent over the maximum operating speed. Close tolerance shall be maintained along the length of the shaft.

N. Each fan shall bear a permanently affixed manufacturer’s nameplate containing the model number and individual serial number for future identification.

O. Fan manufacturer shall provide sound power ratings in the eight octave bands. Sound power levels shall be based on AMCA Standard 301. Sound power ratings shall be in decibels, referenced to 10-12 watts.

P. All equipment shall be seismically secured and restrained in accordance with the Seismic Restraint Manual, Guidelines for Mechanical Systems, latest edition, as published by the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) and designed in accordance with the seismic provisions of the International Building Code (IBC), latest edition, Section 16 and ASCE 7, latest edition, Section 9.6, to the extent that the most stringent provisions are utilized in developing the design seismic forces. See Structural drawings for seismic design criteria.

Q. All dampers shall be of the low leakage type complete with aluminum channel frame, blades and baffles, inflatable fabric reinforced neoprene rubber blade edge seal, spring loaded side seals, and, where required, extended axles. Parallel blade action shall be provided for two position applications. Dampers shall be certified that leakage does not exceed 10 CFM per square foot with 2 inches of static pressure across damper. Dampers shall have stainless steel pins and nylon bushing.

2.02

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2.02 WALL MOUNTED PROPELLER FANS

A. Manufacturer: Provide products made by one of the following:

1. Greenheck, Model AER.

2. Loren Cook Company, Series AWD or AWB.

3. Or approved equal.

B. Type: Wall mounted, propeller fan.

C. Capacity: As specified in the Equipment Schedule on the Contract Drawings.

D. Construction: Steel Wall Fan:

1. Propellers:

a. Airfoil design.

b. Cast aluminum alloy or heavy gauge steel material.

c. Statically and dynamically balanced.

d. Six blades.

e. Propellers equipped with malleable iron split taper bushing for alignment and locking of propeller to the shaft.

1) Bushing held in place by compression and keyed to the shaft to prevent slipping or loosening.

2) Positioned with three standard capscrews for easy assem¬bly and disassembly.

2. Venturi and Panel:

a. Heavy gauge steel.

b. Designed for airfoil propellers.

3. Safety Guard:

a. 1/2 inch by 1/2 inch PVC coated mesh wire screen that meets OSHA standards.

b. Removable sections to provide for easy access to motor.

4. Damper: Motorized damper with end switch.

E. Accessories:

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1. All structural steel used for mounting fans shall be corrosion resistant coated. Mounting hardware shall be steel.

2. The Contractor to provide additional stiffeners, angles and supports as required to mount the fans.

F. Drive:

1. Direct or belt drive as shown on the Contract Drawings.

2. OSHA approved guard.

G. Painting:

1. All external and internal metal surfaces of fans, guards, (except propellers and motors) shall be factory primed and factory painted in accordance with Specification 09900, Painting.

2. Propellers shall be factory coated with a 4 coat baked phenolic coating system minimum of 2 to 3 mils dry film thickness total, of Heresite Series P-413 or approved equal.

2.03 CEILING MOUNT CENTRIFUGAL EXHAUST FAN

A. Fans shall be Model SP as manufactured by the Greenheck and as indicated in the fan schedule.

B. Fans shall be a ceiling mounted, direct driven, centrifugal exhaust fan.

1. Construction: The fan wheel housing and integral outlet duct shall be injection molded from a specially engineered resin exceeding UL requirements for smoke and heat generation. The outlet duct shall have provision for an aluminum backdraft damper with continuous aluminum hinge rod. The inlet box shall be minimum 22 gauge galvanized steel. Motor shall be isolation mounted to a one piece galvanized stamped steel integral motor mount/inlet. A field wiring compartment with disconnect receptacle shall be standard. To accommodate different ceiling thickness, an adjustable pre-punched mounting bracket shall be provided. A white, high impact styrene injection molded grill shall be provided as standard. Unit shall be designed with provision for field conversion from ceiling to in-line. Unit shall be shipped in ISTA Certified Transit Tested Packaging.

2. Wheel: Wheel shall be centrifugal forward curved type, injection molded of polypropylene resin. Wheel shall be balanced in accordance with AMCA Standard 204-96, Balance Quality and Vibration Levels for Fans.

3. Motor: Motor shall be open drip proof type with permanently lubricated bearings and include impedance or thermal overload protection and disconnect plug. Motor shall be furnished at the specified voltage.

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PART 3 EXECUTION

3.01 INSTALLATION

A. The fans shall be installed, connected and placed in proper working order in accordance with the manufacturer's instructions and details, and the Contract Drawings.

3.02 IDENTIFICATION

A. Each unit of equipment shall be identified with the equipment item numbers given on the Contract Drawings, the Specifications or as directed by the Engineer. A corrosion resistant tag or nameplate, securely affixed in a conspicuous place on each unit shall give the equipment item number, manufacturer’s name or trademark and such other information as the manufacturer may consider necessary, or as specified, for complete identification.

3.03 TESTING

A. All tests shall be performed in accordance with the requirements of Division 1 of the Specifications.

B. Field tests shall be performed in accordance with Specification 15951, Testing, Adjusting and Balancing and Division 1 of the Specifications.

3.04 MANUFACTURER’S REPRESENTATIVE

A. The Contractor shall provide the services of a qualified manufacturer's technical representative who shall adequately supervise the installation and testing of all equipment furnished under this Contract. The services of the manufacturer's representative shall be provided for a period of not less than 3 days as follows:

1. One trip of 1 day during installation of the equipment.

2. One trip of 1 day for startup.

3. One trip of 1 day for training.

B. Any additional time required to achieve successful installation and operation shall be at the expense of the Contractor. The manufacturer's representative shall sign in and out each day he is at the project. Travel time to and from the Site shall not be included in measuring the above visits. Only time spent on the Site shall be counted. One day is 8 hours exclusive of travel and lodging time.

C. Training

1. The Contractor shall provide training for Building personnel in accordance with Division 1 - General Requirements.

2. The Contractor shall include in his request for manufacturer approval a certification that the manufacturer has been advised of the requirements

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of Division 1 - General Requirements, and that the costs associated with said training submittals and training have been included in the manufacturer's pricing.

D. Lubricants

1. The manufacturer shall submit a list with a minimum of four manufacturer’s standard lubricants which may be used interchangeably for each type of lubricant required.

2. The Contractor shall utilize this list in preparing his comprehensive lubrication survey as specified in Division 1.

E. The manufacturer's time for training as specified by Division 1 and as specified herein shall not be included under this paragraph.

END OF SECTION 15830

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SECTION 15892

FIBERGLASS REINFORCED PLASTIC DUCTWORK AND DUCT ACCESSORIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified, and required to furnish and install fiberglass reinforced plastic (FRP) ductwork complete with auxiliary equipment and accessories as shown, specified, and/or required for proper operation.

B. The CONTRACTOR shall follow this section for all work associated with the odor control ductwork and valving system up to the inlet of the odor control blower. All duct work shall be FRP as described herein.

1.02 RELATED WORK

A. Odor control equipment is included in Section 11700.

B. Aluminum covers are included in Section 05600.

1.03 REFERENCES

A. Reference standards: comply with applicable provisions and recommendations of the following, except as otherwise shown or specified. General requirements of this contract shall supersede the standards in case of conflict:
   1. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE).
   2. ASTM D 2996 - Specification for Filament-Wound “Fiberglass” (Glass Fiber Reinforced Thermosetting Resin)
   3. ASTM D 3567 - Practice for Determining Dimensions of “Fiberglass” (Glass Fiber Reinforced Thermosetting Resin)
   4. ASTM D 3982 - Blowers and Exhaust Systems for Dust, Contact Molded “Fiberglass” (Glass Fiber Reinforced Thermosetting Resin) Duct and Hoods
   5. NBS PS 15-69 - Custom Contact-Molded Reinforced Polyester Chemical-Resistant Process Equipment
   6. SMACNA Thermoset FRP Duct Construction Manual
   7. U.S. Bureau of Commerce Standard PS-15-69

B. CONTRACTOR shall provide certification that all stainless steel accessories including screws, fasteners, etc. for stainless steel, are Type 316 stainless steel.

C. CONTRACTOR shall provide certification that all FRP accessories including supports, hangers, etc. are FRP.

D. Field Measurements: Take field measurements prior to installation to ensure proper fitting of Work.

E. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

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1.04 SUBMITTALS

A. CONTRACTOR shall submit working drawings, shop drawings and material specifications for the approval of the ENGINEER in accordance with the requirements of Section 01300. Working drawings and shop drawings shall include, but not limited to:
   1. Dimensioned duct layout showing types and locations of supports, hangers, anchors, guides, and expansion joints, sealed by a Professional ENGINEER in the state of Florida.
   2. Details of construction.
   3. Details of installation, hanger details pipe supports, expansion joints and spacing.
   4. Manufacturer's literature, illustrations, specifications, and engineering data.
   5. Manufacturer’s certification of duct layout, including all elbows, fittings, transitions, etc.
   6. Recommended bolting torque values for flanged joints
   7. Joint fabrication details
   8. Flexible connections.
   9. Detailed shipping and installation instructions
   10. Visual inspection checklist
   11. Other technical data related to the specified material and equipment as requested by ENGINEER.

B. Test Reports: Submit the following test reports for approval where required.
   1. Volume damper leakage tests from an AMCA approved testing laboratory.
   2. Test and balance reports as described in Part 3.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Engage a single firm, with undivided responsibility for performance and other requirements and components of the ductwork.
   2. Engage a firm which can show successful experience in the fabrication and erection for ductwork systems of scope and type similar to the required Work.

B. Installer Qualifications:
   1. CONTRACTOR shall have at least 5 years' experience in the installation of the Work specified. He shall employ only tradesmen with specific skills and experience in this type of Work.
   2. CONTRACTOR shall have undivided responsibility as a single firm for performance and other requirements for the installation of the Work specified herein.

C. Requirements of Regulatory Agencies: Comply with applicable provisions of regulatory agencies below and others having jurisdiction.
   1. Underwriters Laboratories, Incorporated (UL)
   2. National Fire Protection Association (NFPA).
   3. National Electrical Code.
   4. Local and State Building Codes and Ordinances:
      a. Florida Building Code 2014 (5th edition).

1.06 DELIVERY, STORAGE, AND HANDLING

A. The Manufacturer shall legibly mark all pipe and specials in accordance with the approved laying schedules and marking diagram. Each duct shall be numbered in sequence and said number shall appear on the laying schedule and marking diagram in its proper location for installation.

B. The CONTRACTOR shall carefully examine all material for defects. Material which is known, or thought, to be defective shall not be installed.

C. The ENGINEER reserves the right to inspect all material and to reject all defective material shipped to the job site or stored on the site. Failure of the ENGINEER to detect damaged material shall not relieve the CONTRACTOR from his total responsibility for the completed work if it leaks or breaks after installation. Lay all defective material aside for final inspection by the ENGINEER to determine if corrective repairs may be made, or if the material is to be rejected. The ENGINEER shall determine the extent of the repairs.

D. The CONTRACTOR shall be solely responsible for the safe storage of all material until it has been incorporated in the completed project and accepted by the ENGINEER.

E. Duct fittings and accessories shall be loaded and unloaded by lifting with hoists or skidding to avoid shock or damage. Under no circumstances shall such materials be dropped. Pipe handled on skidways shall not be skidded or rolled against another pipe. Handling of this material is to be in accordance with AWWA C600.

F. The CONTRACTOR is cautioned to exercise care in handling, loading, unloading, and storing of FRP duct and fittings. All duct and fittings shall be stored under cover before use, and shall be transported in a vehicle with a bed long enough to allow the length of pipe to lay flat so as not to be subject to undue bending or concentrated external load at any point.

PART 2 - PRODUCTS

2.01 GENERAL

A. Manufacturer: Provide FRP duct as manufactured by one of the following:
1. Composites USA
2. Perry Fiberglass
3. Ershigs/Belco
4. Engineered Composite Solutions
5. Southeastern Fiberglass
6. Augusta Fiberglass
7. Industrial Plastic Systems
8. Daniel Company
9. Ameron International
10. L.F. Manufacturing
11. R.L. Industries

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2.02 FIBERGLASS REINFORCED PLASTIC (FRP) DUCTWORK

A. Service Conditions

1. The FRP piping system shall be designed and fabricated for all service to carry warm moisture-laden air with hydrogen sulfide, sulfur dioxide, sulfurs, chlorines, mercaptans and other organic and inorganic compounds typically associated with wastewater treatment.
2. The maximum unsupported spans shall be as follows. Maximum deflection at unsupported span lengths shall be 1% of the duct nominal diameter, including all service loads.

Duct Inside Diameter (Inches)	Maximum Span (Feet)
a. 3 – 14	8’
b. 16 and above	10’

3. Duct wall thickness shall be designed by the Manufacturer to meet the criteria specified in this Section. The minimum wall thickness for all FRP duct shall conform to the following:

Duct Inside Diameter (Inches)	Wall Thickness (Inches)
a. 3 – 16	0.1875
b. 18 – 36	0.250
c. 42 – 60	0.300
d. 72 – 96	0.375

4. Resin:
   a. Resin shall be premium corrosion resistant and fire retardant brominated bisphenol-A vinyl ester. Resin shall not contain pigments, dyes or colorants. Fillers are only permitted for flame retardance and shall not exceed 5% by weight. The product shall have a Class 1 flame spread rating (25 or less) as measured by ASTM E-84. The ENGINEER reserves the right to request the CONTRACTOR to submit laminate samples taken from the job site for confirmation that the specified resin was used throughout the laminate.
   b. Thixotropic agents can be added to control resin viscosity per resin manufacturer’s recommendation.
   c. Acceptable resins with no more than 3 percent antimony trioxide shall be:
      1) Reichhold Dion 9300 FR.
      2) Interplastics CoRezyn 8440.
      3) Ashland Chemical Hetron FR992.
      4) AOC Vipel K-022
5. Reinforcement:
   a. Surfacing veil shall be C glass veil with a silane finish and a styrene soluble binder.
   b. Chopped strand mat shall be Type E glass minimum 1-1/2 ounces per square foot with silane finish and styrene soluble binder.
   c. Continuous roving for chopper gun spray up shall be Type E glass. Chopper gun is only permitted if an automated process is used. Manual operation of chopper gun shall not be permitted.
   d. Woven roving shall be Type E glass minimum 24 ounces per square yard with a five by four weave.
   e. Continuous roving for filament winding shall be Type E glass with a silane finish.

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B. Construction
   1. All FRP ductwork shall be of filament wound or hand lay-up construction.
   2. Maximum allowable deflection for any size ductwork shall be ½ inch between supports for any size of duct under worst case operating conditions.
   3. FRP ductwork shall be designed using a safety factor of 10 for pressure and 5 for vacuum. FRP ductwork shall be designed for a maximum vacuum pressure of 20-inch w.c. and a maximum positive pressure of 10-inch w.c.
   4. Out of roundness of duct shall be limited to ± ¼ inch for duct sizes greater than 30 inches in diameter.
   5. Length of all flanged duct sections shall not vary more than ± ½ inch at 70°F.
   6. All unflanged duct shall be square on the ends in relation to the longitudinal axis within ± 1/8 inch up to and including 24-inch diameter and within ± 3/16 inch for all diameters greater than 24 inches.
   7. Laminates
      a. All ductwork shall have a resin-rich inner surface, an interior corrosion barrier, an interior structural layer and an exterior layer.
      b. Inner surface: Minimum 20 mils thick composed of a single ply of the Type C glass surfacing veil embedded in a resin rich surface. Resin content shall be 90%.
      c. Interior layer: Minimum 100 mils thick composed of at least two layers of chopped strand mat. Resin content shall be 75%.
      d. Structural layer: Type E glass to meet minimum wall thickness as specified. The total wall thickness includes the inner surface and inner layer. The total wall thickness does not include the exterior layer.
         1) Contact molded structural layer shall include alternate layers of chopped strand mat and woven roving.
         2) Filament wound structural layer shall be preceded by a layer of chopped strand mat or spray chop. The structural layer shall consist of a minimum of three complete cross hatched layers of continuous filaments applied in a helix angle of 55 degrees.
      e. Exterior layer: Factory applied paraffinated gel coat with UV inhibitors. Pigmentation shall be determined by the ENGINEER. Pigmentation shall not be added to the exterior layer until visual inspection has been completed.
      f. The duct shall have a Barcol hardness of at least 90 percent of the resin manufacturer's minimum specified hardness for the cured resin when tested in accordance with ASTM D2583.
   8. Fittings:
      a. All fittings shall be hand-lay up construction fabricated from the same resin and having the same strength as the FRP ductwork.
      b. The internal diameter of all fittings shall be equal to the adjacent duct.
      c. The tolerance on angles of all fittings shall be ± 1° up to and including 24-inch diameter and ± ½° for 30 inch diameter and above.
      d. All branches/takeoffs shall be oversized conical taps or boot taps. Straight taps are not acceptable.
   9. Elbows:
      a. The centerline radius of all elbows shall be 1-1/2 times the diameter.

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b. Elbows smaller than 48-inch diameter shall be smooth radius. Elbows 48 inches and larger shall be mitered. Provide a minimum of three mitered joints for all elbows 48 inches and larger.

10. Flanges:
    a. Provide flanged connections to flexible connectors, expansion joints, vessels, demisters, fans, silencers and other locations as shown on the Drawings.
    b. Flanges shall be hand lay-up construction, fabricated from the same resin and having the same strength as the FRP ductwork. Dimensions shall be in accordance with NBS PS 15-69.
    c. Flanges shall be drilled in accordance with NBS PS 15-69 Table 2. Flange faces shall be textured for use with full face gaskets. Backs of bolt holes shall be spot faced for a standard diameter washer.
    d. Flange faces shall be perpendicular to the longitudinal axis of the duct within ½ inch.
    e. Flange faces shall be flat to within ± 1/32 inch up to and including 18-inch diameter ducts and flat within ± 1/16 inch for 20-inch diameter ducts and larger.
    f. Gaskets shall be EPDM, full face and minimum 1/8-inch thickness.
    g. Provide all Type 316 stainless steel bolts, nuts, and washers.
11. Joints:
    a. Provide all butt and strap joints in accordance with NBS PS 15-69.
    b. Field weld kits shall be supplied by the duct manufacturer. All necessary fiberglass and reinforcing material shall be supplied pre-cut and individually packaged for each joint.
    c. All resin, catalyst and putty shall be supplied in bulk to complete all field joints plus 25% extra for waste.
12. There shall be not less than a ¼ inch buildup of FRP over the duct at each duct support.
13. All cut edges shall be coated with resin so that no glass fibers are exposed and all voids filled. Structural elements having edges exposed to the chemical environment shall be made with chopped-strand glass reinforcement only.
14. All non-flanged duct shall be cut square with the axis of the duct within 0.13 inch up to and including 24-inch diameter and to within 0.19 inch for all larger diameter duct.
15. The minimum mechanical properties of duct shall be in accordance with the below table.

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Contact Molded Properties at 73.4°F	Thickness (inches)			
	1/8 - 3/16	1/4	5/16	3/8 & up
Ultimate tensile strength - minimum (psi)	9,000	12,000	13,500	15,000
Flexural strength - minimum (psi)	16,000	19,000	20,000	22,000
Flexural modulus of elasticity, tangent minimum (psi)	700,000	800,000	900,000	1,000,000
Filament Wound Modulus (Hoop & Axial, Resultant)(psi)	1,100,000	1,600,000	1,700,000	1,700,000

2.03 CONTROL DAMPERS

A. Round Fiberglass Reinforced Plastic Dampers
   1. All round FRP dampers shall be the butterfly type. FRP fabrication shall meet the corrosion requirements specified in this Section for FRP ductwork.
   2. Leakage shall not exceed 5.25 CFM/ SQ. FT at 30 inches w.g.
   3. Fabrication:
      a. Frame and Blade: Premium vinyl ester. The blade shall withstand the design conditions without failure, using a safety factor of 5:1 and a minimum deflection not to exceed 1.0% of the diameter.
      b. Shaft: Premium vinyl ester for all manually actuated dampers below 30 inches in diameter and Type 316 stainless steel for all dampers 30 inches in diameter and larger.
      c. Bearings and Bushings: Teflon.
      d. Pins and all Hardware: Type 316 stainless steel.
      e. Shaft seals: EPDM.
      f. Provide all round dampers with a blade stop consisting of FRP angles with full circumference EPDM seals.
      g. All dampers shall have flanged ends. Provide Type 316 stainless steel bolts, nuts and washers.
      h. All manual dampers shall be provided with hand quadrant actuators fabricated of Type 316 stainless steel.
      i. FRP dampers shall be manufactured by Swartwout, Division of Phillips Industries or Belco Manufacturing.

2.04 DUCT HANGERS AND SUPPORTS

A. All duct supports, interior and exterior, shall meet the requirements of Section 15060, Hangers and Supports, except that hangers and supports for FRP duct shall be spaced as specified in Paragraph 2.02 of this Section. Duct spans shall not exceed the duct manufacturer's recommendations or the minimum requirements specified herein.

B. Duct supports located on the exterior of the building shall be designed to include the weight of the duct and to withstand all applicable combinations of wind loading in accordance with the Contract Documents and any additional local Regulations

which are in effect at the time of construction. Exterior supports shall be located as shown on the Drawings and shall be of the "type" shown on the Drawings. The locations of duct supports shown on the Drawings are approximate, and the CONTRACTOR shall be required to confirm the support requirements and locations.

C. The CONTRACTOR shall note that not all duct support locations are shown on the Drawings, and the CONTRACTOR shall follow the Specifications herein in locating additional supports as required. The CONTRACTOR shall be responsible for the design of supports and for the overall stability of the entire support system. Support and hanger details and a detailed layout showing the location of all duct supports and hangers shall be submitted in the shop drawings. The design shall be stamped by a Professional ENGINEER (Structural) registered in the state of Florida.

D. There shall not be less than ¼ inch buildup of FRP over the duct at each saddle support.

E. Duct supports are to be fabricated from fiberglass, including all angles, channels, rods, bolts, etc. All fasteners and anchors are to be 316 SS.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: All FRP duct shall be installed in a neat and workmanlike manner, properly aligned, and cut from measurements taken at the site to avoid interferences with structural members, architectural features, openings and equipment. Exposed pipes shall afford maximum headroom and access to equipment, and where necessary, all piping shall be installed with sufficient slopes (minimum 1/8-inch per foot, unless otherwise noted on the drawings) for venting or drainage of liquids and condensate to low points. All installations shall be acceptable to the ENGINEER. It is recommended that the CONTRACTOR obtain the assistance of the duct manufacturer's field representative to instruct the duct fitters in the correct installation and support of all FRP duct. The CONTRACTOR shall obtain training by the duct manufacturer's field representative in the correct installation and support of all FRP duct. Instruction shall be a minimum of one eight (8) hour day.

B. Supports and Anchors: All piping shall be firmly supported with fabricated or commercial hangers or supports in accordance with the requirements in Section 15060, Hangers and Supports. Where necessary to avoid stress on equipment or structural members, the pipes shall be anchored or harnessed. Expansion joints and guides shall compensate for pipe expansion due to temperature differences.

C. All ductwork located on the Headworks and Odor Control System shall be sloped 1/8-inch per foot towards end of duct runs and shall be provided with eccentric reducers to provide proper drainage.

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3.02 DUCT JOINTS

A. Adhesive Joints: Adhesive joints shall be made with freshly mixed 2-part epoxy on clean dry duct ends. The joints shall be made up at the recommended ambient temperatures, to the duct manufacturer's written recommendations. All duct ends shall be inserted to the full depth of the socket.

3.03 INSPECTION AND FIELD TESTING

A. Inspection: All finished installations shall be carefully inspected for proper joints and sufficient supports, anchoring, interference, and damage to duct, fittings, and coating. Damage and leaks shall be repaired to the satisfaction of the ENGINEER.

B. All ductwork shall be leak tested in accordance with SMACNA Air Duct Leakage Test Manual and Section 15951, Testing, Adjusting and Balancing. Duct system shall be Seal Class B and leakage Class 6. Duct system shall be balanced to provide capture rates from each take-off point within 2.5 percent of the design air flow at system operating flow and pressure or as stated in the HVAC Specifications. The ductwork test report shall be submitted to the ENGINEER.

C. If the system is tested in sections, the leakage rates shall be added to define the performance of the whole system.

END OF SECTION 15892

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SPECIFICATION 15910

INSTRUMENTATION AND CONTROL DEVICES - HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The Contractor shall, through the services of the controls supplier, furnish, install, test and place in operation, all required HVAC and process instrumentation, control devices, gauges, instruments, indicators, actuators, switches, sensors, controllers, etc. as detailed herein and as required by the Contract Drawings. The instruments and controls shall be top quality, standard offerings of a nationally recognized manufacturer. When available, instruments and/or control devices shall be procured from a single manufacturer. The equipment shall be installed in accordance with the Specifications, manufacturer's recommendations and best industry practice. Instruments and controls shall be installed complete with all process connections, supports, mounting brackets and hardware, conduit and wiring, terminations, etc. to provide a complete and properly functioning installation.

B. The Contractor shall provide all programming, configuration, controls and required items and services to furnish a system that enables the heating and ventilating system and equipment to function properly and in accordance with the sequences and schedules specified and as indicated by the Contract Documents. All the hardware, software, configuration and programming necessary to implement the sequences and schedules specified and as indicated by the Contract Documents and as required by the individual equipment and systems shall be provided. The Contractor shall allow reasonable time for additional Owner requested changes to control strategies during and after testing and startup. The Contractor shall furnish configuration sheets, ladder diagrams, written control strategies and logic diagrams for all sequences.

C. The Contractor shall provide all necessary process taps, isolation valves, nipples, penetrations, instrumentation supports, etc. required to provide a complete and operational installation. Conduits, raceways, wiring, junctions for control and signal wiring shown on Electrical Drawings are provided therein. All additional conduit required for a complete installation shall be provided under this specification section.

D. Taps and connections for primary process sensors shall be sized to suit each individual installation and the requirements of the instrument served. It is the Contractor's responsibility to ensure that the sizing, location, orientation and dimensions of instruments and the connections and taps for instrumentation furnished under this Division are such as to provide the required accuracy of measurement, the proper bracing, protection of the sensor from accidental damage and accessibility for maintenance.

E. It shall be the responsibility of the controls supplier to provide instruments that have been properly sized and applied to the process in which they are to be used. The controls supplier shall calculate the proper size, range, material, location, orientation and set point for all instruments provided under his Contract to give the most accurate readings in the appropriate ranges. Calculations shall

be submitted with the instrument for approval. Unless otherwise noted, instruments shall be selected so that the expected nominal operating range is within the middle 1/3 of the instrument's scale.

F. As part of his testing, the Contractor shall assume the responsibility of testing of all electrical work associated with this system.

G. Instruments and controls shall be correctly interfaced to the system and equipment to which they are associated and connected. Mounting brackets and/or stands, hardware, anchors and appurtenances shall be furnished and installed as required.

H. Instruments shall be installed in logical groups associated with a specific piece of equipment or system and shall be readable from a central location near the associated equipment. Instruments shall be oriented so as to be easily readable from the floor.

1.02 RELATED SPECIFICATIONS

A. All work of this Division shall meet the requirements of the following related Sections and Divisions.

1. Division 15

2. Division 16 – Electrical.

1.03 SUBMITTALS

A. The Contractor shall submit working drawings, shop drawings and material specifications for all equipment and work provided, for the approval of the Engineer in accordance with the requirements of Division 1 and 15.

B. Submit the following items for review and approval by the Engineer:

1. Completed ISA S20 data sheets, installation and instruction manuals, operation and maintenance manuals, for each and all items provided under this Section, for review and approval. Each item's data sheet shall have a complete listing of tag numbers to which that data pertains.

2. Manufacturer's installation, operation and maintenance manuals.

3. Software, manuals and configuration data for all units requiring programming and/or configuration.

4. Drawings and descriptions of supports, mounting details and process connections and taps for all instruments.

5. Calculations, assumptions and manufacturers recommended installation requirements indicating the methods used in proper sizing, location and orientation of all instruments.

6. Submit for review and approval, instrument installation layout drawings showing proposed locations of all instruments and equipment. The drawing shall be done to scale and dimensioned on a background of equipment and piping.

1.04 SPARE PARTS AND SPECIAL TOOLS

A. The Contractor shall provide spare parts and special tools for all equipment supplied, in accordance with Division 1. The specifications and as detailed herein. Deliver all spare parts, tools and supplies with the equipment, neatly wrapped and boxed, indexed and tagged with complete information on their use and reordering.

B. Provide all of the individual manufacturers recommended spare parts and tools for all equipment specified herein. In addition to the recommended spares, furnish all of the following minimum spare parts, tools and devices. Spare parts and special tools shall be provided in accordance with the requirements of Division 1.

1. General

a. Provide 10% (minimum of 10) spare fuses, indicating lights, etc., for each size and type provided.

2. Electronic Field Instruments

a. Provide 1 complete spare instrument of each type for every 10, or part thereof furnished (minimum of 2). Included shall be any integral indicators, adapters, converters and modules needed to provide a complete functional replacement. Where similar units have been provided having different characteristics or ranges, the afformentioned quantities shall pertain to each type. Where instruments of the same type having different ranges are provided and the unit can be rescaled by field adjustment, the quantities listed shall apply to the total number provided.

3. Primary Sensing Elements

a. One spare of each size and type, complete with housing and appurtenances for each 10 or part thereof installed (Minimum of 1).

4. Pressure and Temperature Switches

a. One spare of each size, type and range, complete with housing and appurtenances for each 5 or part thereof installed (Minimum of 2).

5. Panel Mounted Instruments (Includes Loop Controllers, Digital Indicators, Run Time Meters, Isolators, converters, etc.)

a. One spare of each size, type and range, complete with housing and appurtenances for each 10 or part thereof installed (Minimum of 2).

b. In addition to the spares required above the Contractor shall provide:

1) One spare power supply for every 5 or part thereof installed (Minimum of 2).

2) One spare electronic module, indicator and/or circuit board for every 5 or part thereof installed (Minimum of 1).

3) One complete set of memory modules for each controller installed with the current program preloaded.

6. Non Electronic Gauges, Indicators, Thermometers, etc.

a. One spare gauge or indicator of each size, type and range, complete with appurtenances (diaphragms, snubbers, thermo-wells, capillaries, etc.) for each 10 or part thereof installed. All units shall be tested, certified and ready for use. Units with diaphragm seals, remote capillaries, etc., shall be filled, tested as a unit and ready for use.

b. One spare appurtenant device (snubbers, manifolds, diaphragms, etc.) of each size and type for each 10 installed. (Minimum of 1).

7. Actuators

a. Provide 1 spare actuator of each size, type and rating (valve and damper, two position and modulating) for each 5 or part thereof installed.

8. Fuses

a. Provide 10% spare fuses (minimum of 10) for each type and rating used in field and panel instrumentation. (Including test equipment).

C. Tools:

1. Special tools, other than those normally found in an electronic Technician's tool box, required to test, diagnose, calibrate, install, wire, connect, disconnect, assemble and disassemble any digital equipment, instrument, panel, rack, cabinet or console mounted equipment for service and maintenance shall be provided (i.e., connector pin insertion and removal tools, wire crimping tool, special wrenches, special instrument calibrators/configurators, indicator lamp insertion and removal tools, etc.).

2. The Contractor shall furnish all tools and test equipment, complete with items such as instruction manuals, carrying/storage cases, unit battery charger where applicable, special tools, calibration fixtures, cord extenders, patch cords and test leads, which are not specified but are necessary for field testing or maintaining equipment supplied under this Contract.

1.05 WORK NOT INCLUDED

A. Instrumentation/controls specifically identified in the Contract Drawings as being furnished with mechanical equipment shall be furnished and installed by the vendor or as specified elsewhere in the Contract Documents but will be calibrated and tested under this Section for proper operation and interface with the controls.

B. Electrical conduit and wire specifically shown on the electrical drawings.

1.06 UNITS

A. Units shall be as follows:

VARIABLE	**UNITS**
Temperature	Degree F
Pressure	
- Below Atmospheric	Inches Of Hg Absolute
-Near But Below Atmospheric	Inches Of Water
- Above Atmospheric	PSIG
-Absolute	PSIA Or Inches Of Hg Absolute
Level	0 To Linear Feet Or Quantity
Flow	
-Liquids	GPM @ 60 Degrees F
-Gas Or Vapor	SCFM @ 60 Degrees F and 14.7 PSIA
Pump Speed	0-100%
Relative Humidity	0-100%

Capacity	0-100%
Heating Load	BTUS

1.07 IDENTIFICATION

A. All instruments shall have an engraved stainless steel information tag. As a minimum the tag shall indicate the full instrument tag number, manufacturer, model, range and serial number. The tags shall be affixed with stainless steel screws. When screw mounting is not possible, a braided stainless steel lanyard shall be used. Characters shall be 1/8 inch minimum.

B. Each wall or stand mounted electronic instrument shall have mounted adjacent to it an engraved laminated tag, (white with 1/4 inch black letters), indicating tag number, system, subsystem and measured variable. Engravings shall be approved by the Engineer.

1.08 SIGNALS

A. All electronic instruments (transmitters) shall provide a linear 4 to 20 milliamp signal at a nominal 24VDC. The signal shall be proportional to the process variable indicated. Signal conditioning (such as square root extraction or frequency conversion), if needed, shall be done by the transmitter electronics.

B. All electronic devices (when available) shall be the microprocessor based “smart” type. Milliamp signals (4 - 20mAdc) shall have a superimposed Hart digital signal which will allow for remote communication with these devices. Handheld programmers shall be provided.

C. Discrete switch closure contacts shall use nominal 120 VAC control voltage. 24 Vdc discrete contact closures shall be used where indicated. All devices shall be rated for 120 Vac as a minimum. Contact rating shall be 2 amp minimum unless otherwise noted.

PART 2 PRODUCTS

2.01 PANEL MOUNTED INSTRUMENTS

A. Digital Indicators

The Contractor shall furnish and install Digital as specified herein.

1. Function: Display of calculated or real world process variables. Various signals are called out for digital display in the Contract Documents. Any signals that can not be displayed on the face of the appropriate SLC (the signal to be displayed must be related to the major function of the SLC), shall be displayed on combination bargraph-numeric readout display units.

2. Field and Panel Indicators: Unless otherwise noted, alpha-numeric display of indicators mounted in the field shall be LCD type panel mount shall be LED type. The height of alpha-numeric display shall be 1/2-inch minimum. External power supplies shall be provided as needed. Indication shall be in engineering units with a minimum of 1 decimal place display resolution (ie. XXX.X degree F).

B. Signal Conditioners

The Contractor shall furnish and install Signal Converters as stated herein.

1. Function: Translation of incompatible signal types, ranges, voltages etc. for use by process control equipment.

2. Type: Converters shall be of the plug in type, utilizing all solid state circuitry suitable for rack mounting within panels.

3. Power supply: 120VAC, 60 Hz where required by the converter.

4. Accuracy: 0.1% of span, deadband shall be 0.1% span, maximum.

5. Remarks: Where specific converters are not listed, but are required to interface with the current or future process control system, they shall comply with the general requirements stated herein.

C. Current Isolators

The Contractor shall furnish and install Current as stated herein.

1. Function: To provide an isolated current loop, calculations or signal amplification between the plant's new, future and existing process control systems and existing analog instrumentation and control loops.

2. Type: Converters shall be of the plug in type, utilizing all solid state circuitry suitable for rack mounting within panels.

3. Power supply: 120VAC, 60 Hz where required by the converter.

4. Accuracy: 0.1% of span, deadband shall be 0.1% span, maximum.

5. Circuit loading: Isolators shall be sized such that resistance of new or existing loops shall not exceed maximum rated resistance.

6. Manufacturer: Moore Industries, or approved equal.

D. Current Switch Alarms (alarm trips)

The Contractor shall furnish and install current switch as stated herein.

2.02 AUTOMATIC TEMPERATURE CONTROL DEVICES

A. Thermostats (Non-Corrosion Resistant)

The Contractor shall furnish and install room thermostats in non-corrosive in accordance with the following.

1. Function: Temperature based on/off control of cooling equipment.

2. Type: Commercial, line voltage on/off control.

3. Switch Type: Snap action contacts.

4. Contact Rating: 120Vac,16A.

5. Operating Range: 50 - 110 degrees F.

6. Mounting: Vertical on recessed electrical box.

7. Enclosure: external set point display and thermometer, moisture and fungus resistant.

8. Sensor: internal,external coiled capillary, tinned copper/corrosion resistant..

9. Adjustments: removable set point knob, adjustable differential (as required).

10. Accessories: Manual switching sub-base with HAND-OFF-AUTO switch.

11. Manufacturer / Model: Honeywell T6051 with Q651 sub-base or approved equal.

B. Damper Actuators (Two-Position and Modulating)

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Belimo Aircontrols (USA), Inc.

   b. Honeywell Building Solutions; Honeywell International, Inc.

   c. Johnson Controls, Inc.

   d. Schneider Electric USA, Inc.

   e. Siemens Industry, Inc., Building Technologies Division.

2. Source Limitations: Obtain electric and electronic control actuators from single manufacturer.

3. Type: Motor operated, with or without gears, electric and electronic.

4. Voltage:

    a. 24 V or 120 V.

    b. Actuator to deliver torque required for continuous uniform movement of controlled device from limit to limit when operated at rated voltage.

    c. Actuator to function properly within a range of 85 to 120 percent of nameplate voltage.

5. Construction:

    a. Less Than 100 W: Fiber or reinforced nylon gears with steel shaft, copper alloy or nylon bearings, and pressed-steel enclosures.

    b. 100 up to 400 W: Gears ground steel, oil immersed, shaft-hardened steel running in bronze, copper alloy, or ball bearings. Operator and gear trains are to be totally enclosed in dustproof cast-iron, cast-steel, or cast-aluminum housing.

    c. Greater Than 400 W: Totally enclosed reversible induction motors with auxiliary hand crank and permanently lubricated bearings.

6. Local Field Adjustment: Make spring-return actuators easily switchable from fail-safe open to fail-safe closed in the field without replacement.

7. Local Manual Override: Provide gear-type actuators with an external manual adjustment mechanism to allow manual positioning of the damper when the actuator is not powered.

8. Two-Position Actuators: Single direction, spring return or reversing type.

9. Modulating Actuators:

    a. Capable of stopping at all points across full range and starting in either direction from any point in range.

10. Position Feedback:

    a. Equip two-position actuators with limit switches or other positive means of a position indication signal for remote monitoring of open and close position.

    b. Equip modulating actuators with a position feedback through current or voltage signal for remote monitoring.

c. Provide a position indicator and graduated scale on each actuator indicating open and closed travel limits.

11. Fail-Safe:

a. Where indicated, provide actuator to fail-safe to an end position.

b. Internal spring-return mechanism to drive controlled device to an end position (open or close) on loss of power.

c. Batteries, capacitors, and other nonmechanical forms of fail-safe operation are acceptable only where uniquely indicated.

12. Integral Overload Protection:

a. Provide against overload throughout the entire operating range in both directions.

b. Electronic overload, digital rotation sensing circuitry, mechanical end switches, or magnetic clutches are acceptable methods of protection.

13. Damper or Valve Attachment:

a. Unless otherwise required for damper interface, provide actuator designed to be directly coupled to damper shaft without need for connecting linkages.

b. Attach actuator to damper drive shaft in a way that ensures maximum transfer of power and torque without slippage.

c. Bolt and setscrew method of attachment is acceptable only if provided with at least two points of attachment.

14. Temperature and Humidity:

a. Temperature: Suitable for operating temperature range encountered by application with minimum operating temperature range of minus 20 to plus 120 deg F.

b. Humidity: Suitable for humidity range encountered by application; minimum operating range is to be from 5 to 95 percent relative humidity, noncondensing.

15. Enclosure:

a. Suitable for ambient conditions encountered by application.

b. NEMA 250, Type 12 for indoor and protected applications.

c. Provide actuator enclosure with a heater and controller where required by application.

16. Stroke Time:

a. Select operating stroke time to be compatible with equipment and system operation, and as follows.

1) Fully closed to fully open position within 75 seconds.

2) Fully open to fully closed position within 75 seconds.

3) Move to fail-safe position within 20 seconds.

b. For actuators operating in smoke-control and other life-safety systems, comply with governing code and NFPA requirements.

17. Select actuators to fail-safe in desired position in the event of a power and signal failure.

18. Actuator Fail-Safe Positions:

a. Fail Close.

19. Accessories: Furnish and install NEMA 4 power disconnect switch for each operator.

PART 3 EXECUTION

3.01 GENERAL

A. Instruments shall be installed and oriented so as to be easily accessible and readable from the process floor.

B. Electronic instruments of a single system or subsystem shall have their indicators and transmitters grouped so as to facilitate calibration and viewing by personnel.

C. Unless otherwise specified, instrument enclosures shall be 316 SS or copper free cast aluminum construction. PVC coating shall be provided where severe corrosion is indicated.

D. Where separate elements and transmitters are required, they shall be fully matched, and unless otherwise noted, installed adjacent to the sensor. Special cables or equipment shall be supplied by manufacturer.

E. It is the purpose and intent of these Documents that all embedded instrumentation supports, and the installation of instrumentation and controls shall be provided under this Contract.

F. Taps and connections for primary process sensors shall be sized to suit each individual installation and the requirements of the instrument served. It is the Contractor's responsibility to ensure that the location, orientation and dimensions of the connections and taps for instrumentation furnished under this Section are such as to provide the proper bracing, the required accuracy of measurement, protection of the sensor from accidental damage and accessibility for maintenance while the plant is in operation.

G. The Contractor shall coordinate panel and field instrumentation which are in the same control loop. These instruments shall be of the same manufacturer and/or shall be fully matched.

H. Panel mounted instruments such as loop controllers shall be provided with a slide out chassis.

I. Instruments and controls shall contain no mercury in any quantity for any purpose.

3.02 LOCATION

A. Instrument locations indicated on drawings are diagrammatic. Actual locations shall be as close to the drawing locations as possible, in accordance with the manufacturer’s recommendations, field verified and approved by the Engineer.

B. Location and mounting detail drawings for all equipment shall be submitted to the Engineer for review and approval prior to any work commencing.

C. Equipment shall be installed in locations approved by the Engineer and out of the way of potential damage. Items shall be installed so as to provide ease of maintenance and operation. Equipment shall not be installed where it impedes access or egress within an area. In addition, the installation shall not block or impede maintenance or operational access to other equipment.

3.03 MOUNTING

A. All instruments and equipment shall be securely and rigidly supported and mounted. Equipment shall be supported by structural members and not from other equipment or systems. When instruments such as gauges and switches are supported by pipe nipples, the pipe size shall be 1/2 inch minimum to the process pipe. Where shown on the drawings, mounting details shall be followed. All equipment specified under this Section shall be installed per the Contract Documents, manufacturer’s recommendations and standard industry practice. When installation methods are not shown or specified, the manufacturer’s recommendations shall be used after review and approval by the Engineer. All mounting and supporting hardware and appurtenances shall be furnished and installed under this Contract.

B. Instruments requiring calibration shall not be mounted more than 8 feet above the floor or their access platform. Such instruments shall be remote mounted

and tubed or connected with armored capillary as appropriate, and mounted at eye level.

3.04 ELECTRICAL REQUIREMENTS

A. Instruments requiring electrical power or signal connections shall have sufficient length of flexible conduit and wire to allow easy removal without disconnection from the system. Flexible connections shall be a minimum of 12 inches and a maximum of 24 inches long unless otherwise approved by the Engineer in writing.

B. Electrical connections of wires to instruments shall be by screw terminal. When an instrument or device's terminals will not accept a #12 awg control or power wire, or when factory installed pigtails are provided, a suitable junction box, in accordance with Division 16 and area classification, shall be furnished and installed with and connected to the instrument.

C. All instruments requiring 120 Vac power shall be supplied with an external power disconnect switch and surge suppressor. The switch and suppressor shall be rated NEMA 4X and fabricated of stainless steel. Under this Contract the instrument shall be connected to the switch and isolator using 3/4 inch liquid tight flexible metal conduit and #12 awg conductors. In hazardous areas all work shall comply with the NEC and electrical specifications. Coordinate all installations with electrical installer.

3.05 ADJUSTMENT AND CLEANING

A. General

1. The System Supplier shall comply with the requirements of Division 1 and Division 15 of these Specifications and all instrumentation and control system tests, inspection, and calibration requirements for all instrumentation and controls provided under this Contract and specified herein. The Engineer, or his designated representative(s), reserve the right to witness any test, inspection, calibration or start up activity. Acceptance by the Engineer of any plan, report or documentation relating to any testing or commissioning activity specified herein shall not relieve the Contractor of his responsibility for meeting all specified requirements.

2. The System supplier shall provide the services of factory trained technicians, tools and equipment to field calibrate, test, inspect and adjust each instrument to its specified performance requirement in accordance with manufacturer's specifications and instructions. Any instrument which fails to meet any Contract requirements, or any published manufacturer performance specification for functional and operational parameters, shall be repaired or replaced, at the discretion of the Engineer, at no cost to the owner. The Contractor shall bear all costs and provide all personnel, equipment and materials necessary to implement all installation tests and inspection activities for equipment specified herein.

3. At least 60 days before the anticipated initiation of installation testing, the Contractor shall submit 14 copies to the Engineer of the detailed description of the installation tests to be conducted to demonstrate the correct operation of the instrumentation supplied hereunder.

B. Field Instrument Calibration Requirements

1. The System Supplier shall provide the services of factory trained instrument technicians, tools and equipment to field calibrate each instrument supplied under this Contract to its specified accuracy in accordance with the manufacturer's specification and instructions for calibration.

2. Each instrument shall be calibrated at 0, 25, 50, 75 and 100 percent of span using test instruments to simulate inputs and read outputs. Test instruments shall be rated to an accuracy of at least 5 times greater than the specified accuracy of the instrument being calibrated. Where applicable, such test instruments shall have accuracies as set forth by NIST (National Institute of Standards and Technology).

3. The System Supplier shall provide a written calibration sheet to the Engineer for each instrument, certifying that it has been calibrated to its published specified accuracy. The Contractor shall submit proposal calibration sheets for various types of instruments for Engineer approval prior to the start of calibration. This sheet shall include but be limited to date, instrument tag numbers, calibration data for the various procedures described herein, name of person performing the calibration, a listing of the published specified accuracy, permissible tolerance at each point of calibration, calibration reading as finally adjusted within tolerance, defect noted, corrective action required and corrections made.

4. If doubt exists as to the correct method for calibrating or checking the calibration of an instrument, the manufacturer's printed recommendations shall be used as an acceptable standard, subject to the approval of the Engineer.

5. Upon completion of calibration, devices calibrated hereunder shall not be subjected to sudden movements, accelerations, or shocks, and shall be installed in permanent protected positions not subject to moisture, dirt, and excessive temperature variations. Caution shall be exercised to prevent such devices from being subjected to over voltages, incorrect voltages, over pressure or incorrect air. Damaged equipment shall be replaced and recalibrated at no cost to the owner.

6. After completion of instrumentation installation, the System Supplier shall perform a loop check. The Contractor shall submit final loop test results with all instruments listed in the loop. Loop test results shall be signed by all Contractor representatives involved for each loop test and witnessing Engineer.

END OF SECTION 15910

CONTROL PANELS, ENCLOSURES AND DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The Contractor shall furnish, install, test and place in satisfactory operating condition, control panels, equipment enclosures and associated devices as indicated in the Specifications, and as shown on the Contract Drawings. The term enclosures shall apply to both equipment enclosures and control panel enclosures. All control panels and equipment enclosures shall be designed, assembled and furnished by the controls supplier. The equipment shall be installed by the Contractor in accordance with the specifications, manufacturer's recommendations, Contract Drawings and best industry practice, together with all wiring, terminations, etc. to interface all instrumentation and controls, as required. Panels and enclosures shall be installed under the direct supervision of the controls supplier. Mounting equipment such as brackets, stands, hardware and appurtenances shall be provided as required.

B. This Section describes the requirements for all control panels and equipment enclosures housing control and instrumentation equipment, PLC, I/O and network hardware, operator interface terminals, wiring, terminals, etc. supplied for this contract, and the following:

1. Control Panel Fabrication.

2. Equipment Enclosures.

3. Control Panel Equipment and Devices.

1.02 RELATED SPECIFICATIONS

A. All work of this Division shall meet the requirements of the following related Sections and Divisions.

1. Specification 15910 – I&C Devices - HVAC.

2. Specification 15951 - Testing, Balancing and Adjusting.

1.03 REFERENCES

A. All equipment and services provided herein shall be in accordance with the references stated in the Specification 15910.

1.04 SUBMITTALS

A. Submit working drawings, shop drawings and material specifications for the approval of the Engineer in accordance with the requirements of Division 1.

B. The Contractor shall submit the following items as a minimum for review and approval by the Engineer:

1. Detailed fabrication drawings of all equipment provided under this Section. Drawings shall show materials; all dimensions both internal and external; internal equipment layout, dimensions and spacing; power input and wiring terminal locations; mounting location, heights, finishes and installation details.

2. Detailed data sheets, installation manuals, instruction and operation manuals, manufacturers literature, options and all other pertinent information for all equipment provided under this Section.

3. Complete schematic wiring diagrams and internal point to point wiring diagrams for all units.

4. Factory and field testing procedures and certified results.

1.05 SPARE PARTS AND SPECIAL TOOLS

A. Provide all of the individual manufacturers recommended spare parts and tools for all equipment specified herein. In addition to the recommended spares, furnish all of the following minimum spare parts, tools and devices. Spare parts and special tools shall be provided in accordance with the requirements of Division 1.

1. General

   a. Provide 20% (minimum of 10) spare fuses, lamps for indicating lights, etc., for each size and type provided.

2. Relays, Circuit Breakers, Fuse Holders, etc.

   a. Provide 10% (minimum of 2) spares of each size, type and configuration for each 10 or part thereof installed.

3. Panel Mounted Switches, Push Buttons and Indicating Lights

   a. Provide 10% (minimum of 2) spares of each size, type, color and configuration for each 10 or part thereof installed. (Including contact sets)

4. Terminals and Mounting Strips

   a. Provide (20% minimum of 10) spares of each size, type and configuration for each 10 or part thereof installed. (Including mounting rail)

5. Specialty Items Not Listed

   a. Provide 10% (minimum of 2) spares of each size, type and configuration for each 10 or part thereof installed.

1.06 SHIPPING AND STORAGE

A. Each panel shall be identified with purchaser's complete order number and tag number on a metal tag securely wired to the panel. Each component requiring identification for proper assembly shall be tagged separately.

B. Panel shall be so packaged and packed that, with customary handling, it will be protected from damage in shipment. Each shipping section shall be mounted on skids.

C. Before packing, all equipment shall be clean and dry.

D. All electrical wiring leads between panel sections shall be clearly marked for reassembly, and shall be coiled and rigidly held within the panel framework.

E. Special handling instructions shall be conspicuously placed on all equipment requiring unusual handling and shipping care.

F. In general standard panel instruments such as indicators, which can be damaged during transit shall be removed and shipped separately.

G. When equipment is transported to the job site by ship, the following shall apply:

1. All equipment shall be shipped as below deck cargo.

2. Whenever practicable, panels shall be bolted to container frames. All exposed tubing, wiring, and instruments shall be protected by padding. Containers shall be lined with water proofing materials.

3. Instruments shipped separately shall be packed in moisture-proof containers with a desiccant and held in a fixed position with packing.

4. Crates and boxes shall be reinforced with steel straps. Crates and boxes with a net weight in excess of 400 lbs. shall have diagonal bracing on all faces. When net weight is in excess of 500 lbs., skids shall be bolted to the container frames.

H. All equipment, once assembled, whether stored at the factory, on site or at a remote location, shall be kept protected and free from damaging environmental conditions. Unless otherwise specified, equipment shall be kept in a dry, dust free, temperature controlled area, free from temperature and humidity fluctuations, and in accordance with the equipment manufacturers recommendations. As a minimum, temperature shall be kept above 55 degrees F and no condensation shall occur.

PART 2 EQUIPMENT

2.01 GENERAL REQUIREMENTS

A. The Contractor shall furnish and install control panels and enclosures to house all instrument, control and electronic equipment, wiring, terminals and accessories. Control panels and enclosures shall be provided as stated herein. Control panels and enclosures shall be assembled, wired, and tested in the Controls Suppliers own or other Engineer/Owner approved facility of his choosing. All components and all necessary accessories such as power supplies, power conditioning equipment, mounting hardware, input and output terminal blocks, plug strips, relays, lighting, circuit breakers, fuses, etc., which may be required to complete the system shall be provided. Internal layout and internal point to point wiring for typical panels shall be identical.

B. Unless otherwise indicated, panels, enclosures and all exposed panel mounted devices, shall have a minimum of a NEMA 12 rating. Enclosures shall be formed or welded construction, reinforced with Unistrut, Powerstrut, or approved equal to stiffen panels and doors and facilitate mounting of internal components or equipment. Enclosures shall be 16 USS gauge for units with all dimensions 24 inches or less, 14 USS gauge for units with all dimension greater than 24 inches and less than 48 inches. Enclosures with any dimension of 48 inches or more shall be 12 USS gauge. All floor mounted units shall be 12 USS gauge and shall be provided with jackscrews for leveling. For large and floor standing panels, each shipping section shall be provided with four removable lifting lugs.

C. Doors shall be formed, with welded continuous hinged swing type with the hinge running vertically. Door swing shall be a minimum of 165 degrees. Door closure hardware on NEMA 12 units shall be a three point closure system with single external lockable handle. Multiple clamp type closure is acceptable for small enclosures containing only terminals or non maintenance items. NEMA 4 and 4X units shall have multiple clamp type closures on three sides of the door with padlock accessories and locks. Sufficient doors and access panels shall be provided to facilitate maintenance and testing of the supplier's equipment. All doors shall be fitted with common keyed locks. The door edges and panel opening shall be rolled to prevent the entrance of water and debris when panels are opened.

D. The use of prefabricated, standard "Hoffman" type industrial enclosures is acceptable. The enclosures shall be purchased factory finished as required herein.

E. Provide additional stiffeners or separate mounting panels for OIT units mounted in panels.

F. Steel members shall be provided in the back of the panel for rigidity and support of wiring, accessories, etc. Stiffeners shall be welded to the back face of the panel where required. Stiffeners shall not interfere with instrument installations and weld marks/discoloring shall not be visible. Sufficient stiffeners and/or supports shall be provided so that the panel face does not distort due to the weight of the instruments or equipment.

G. All equipment and devices shall be identified with engraved nameplates both inside and out. The equipment shall be mounted such that service can occur

without removal of other equipment. Face mounted equipment shall be flush or semi-flush mounted and gasketed, with flat black escutcheons. All equipment shall be accessible such that adjustments can be made while the equipment is in service and operating.

H. The Contract Drawings show approximate dimensions of control panels and preferred front layout. The Contractor shall be responsible for detailed design of all control panels and enclosures. All panels and enclosures shall have a minimum of 6 inches of clear perimeter gutter space from internal equipment (including terminal strips and wireway) to the enclosure wall. Enclosures with a dimension greater than 36 inches shall have a minimum of 12 inches clear gutter space. Panel enclosures shall not be crowded. Ample space shall be provided between components to allow for heat dissipation and servicing. The internal components shall be arranged such that they can be serviced without removing other components.

I. All control panels shall have a single power supply entry point and a power disconnect switch. Control devices shall be mounted in functional groups in accordance with good panel design practice so as to present a neat and functional appearance and so as to be readily identifiable and accessible for adjustment and service. The panel arrangement shall be approved by the Engineer.

J. All panels and enclosures shall have sub plates and sub panels for mounting equipment. These shall be USS gauge #10 minimum and painted gloss white. A bonding jumper to the enclosure, of #10 AWG copper wire or braid shall be provided.

K. Cut outs shall be made, without distorting the face of the panel, to the dimensions and tolerances specified on the instrument manufacturer's certified drawings. Cutouts shall be saw cut or punched smooth and straight, or round as required, parallel to the panel sides and ground smooth and free from burrs. Flame cutting will not be accepted. Both the front and back surfaces of the panel face near the cut outs shall be level to permit proper instrument installation.

L. Panels shall be furnished with red laminated plastic warning signs in each section. The sign shall be inscribed "WARNING This Device Is Connected To Multiple Sources Of Power". Letters shall be 1/2 inch high, white.

M. Floor mounted panels shall be free standing, requiring no external bracing or support. Angle Iron framing shall be provided at the bottom part of each panel. The framing shall be box construction, with all corners fully welded, and shall be reinforced with additional members as required to prevent buckling or distortion of the frame or the panel face due to normal handling during transportation and final assembly. The bottom 12 inches of floor mounted panels shall have no equipment or terminals located there.

N. The rack framework shall be welded steel construction 1 5/8 x 5/8 inch using Powerstrut, Unistrut, or approved equal and/or angle iron to provide a rigid assembly. Racks shall be of open, box like framework with all frame supports

welded and ground smooth. Steel straps shall be used for locating terminal blocks. The terminal blocks shall be factory assembled on a miniature mounting channel and the channel bolted to the steel strap.

O. The joints at the bottom of the panel shall be even and flat to within 1/16 inch. Care shall be taken that the weight of each section is carried by the framework, and not by the bottom edge of the panel face.

P. Panels, which are mounted on concrete slab shall be furnished with base bolt holes at the channel base for use in anchoring the panel to the slab. Removable lifting lugs shall be provided at the top of each panel. All mounting hardware and anchors shall be of 316 stainless steel.

Q. Floor standing panels shall have solid bottoms. Panels in control rooms shall have all wireways brought directly into the panel bottom.

R. All panels and enclosures shall be provided with a steel pocket for keeping drawings. One extra set of the as built drawings shall be provided and kept in the panel.

2.02 ELECTRICAL REQUIREMENTS

A. All control panels and enclosures shall be powered by 120 vac unless otherwise specified. UPS protection shall be provided as indicated and will be supplied under this Contract. Panels and enclosures containing operator interface terminals shall have UPS protection for the OIT. The UPS shall be provided in accordance with Division 16.

B. The wiring terminals shall be rail mount, screw type lift plate or suitable for solderless horseshoe connectors and rated at least 20 amps at 600 volts. The screws for solderless terminals shall be # 8 minimum. They shall be marked with a permanent, continuous marking strip from end to end with the numbers appearing on the approved shop drawings. One side of each terminal strip shall be reserved exclusively for field wiring. Common connections and jumpers required for internal wiring shall not be made on the field side of the terminal. Subject to the approval of the Engineer/Owner, a vendor's pre engineered and prefabricated wiring termination system will be acceptable. Terminals for field wires shall be provided in an easily accessible area of the panel.

Terminal blocks for current transformer circuits shall be the shorting type. Shorting terminal blocks shall be provided for all C.T. circuits when entering or leaving the panel.

C. Wiring shall comply with accepted standard instrumentation and electrical practices. For each pair of parallel terminal blocks, the field wiring shall be between the blocks. Lift plate or box type terminals shall be used for connecting wires to terminal blocks. Solderless horseshoe connectors with insulating sleeves and # 8 bolt hole shall also be acceptable. The terminals for field wiring shall be properly sized UL approved to accept field wires of #12 gauge. Fused

terminal blocks of the same style shall be used for all output connections to field devices.

D. All wiring shall be enclosed in vented plastic wireway with covers. Wireways shall not be filled to more than 40% of capacity. Where wireway is not possible, conductors shall be run open and shall be bundled and bound at regular intervals, not exceeding 6 inches with nylon cable ties. The bundles shall be secured at intervals not to exceed 12 inches. Care shall be taken to separate electronic signal, discrete signal, and power wiring. Where wiring crosses on to a hinged panel, the wiring shall be bundled and run vertically along the hinge as long as possible to better distribute the twisting forces. The bundle shall be secured at both ends to the panels.

E. Interior panel wiring and field wiring shall be color coded and tagged at all terminations and devices with machine printed plastic sleeves. The wire number shall be as indicated on the approved shop drawings.

F. All incoming and outgoing wiring shall terminate on panel terminal blocks unless approved otherwise in writing by the Engineer. The System Supplier shall furnish all wiring between panel mounted instruments and the terminal blocks. Terminal blocks shall be rated at least 600 volts, 20A, Square D Type G, or approved equal.

G. At shipping joints, interpanel wiring shall be completely installed, terminated with terminals, identified, factory tested and then coiled back for shipping.

H. All wiring to devices mounted on enclosure doors shall be extra flexible and enough slack must be provided to prevent any tension when doors are at maximum opening. Wiring bundles run from panels to doors, shall be run lengthwise along the hinge to spread the opening torque along the greatest length of cable. Permanent cable anchors shall be provided at both ends of the cable to eliminate any torque being applied to wiring terminals.

I. All wire mounts shall be either Epoxy glued or screwed to the equipment mounting plate. Screws shall not penetrate the enclosure. Stick on or self sticking wire mounts will not be acceptable.

J. For incoming wiring provide enclosed wiring troughs in the panel reserved for incoming field wires and wireways from the troughs direct to instrument terminals. Provide these troughs at bottom of panel if incoming wiring is from below.

K. Terminal block layout shall be such as to provide ample access to wiring during installation, checkout, and maintenance. Minimum spacing between adjacent terminal blocks and/or panel edge shall be 6 inches. A minimum of 6 inches space shall be provided at the top and bottom of panels and enclosures.

L. Duplicate terminals shall be provided on the panel for common field wires (such as annunciator common, AC power leads, neutrals, etc.) to limit the maximum number of wires on a terminal to two. Spare terminals equal to not less than

25% of the required points shall be furnished. Jumpers if required shall be connected to the panel manufacturer's side of the terminal blocks.

M. All incompatible circuits (such as low level signals) shall be separated from power circuits and/or each other with separate slotted wireway and junction boxes.

N. Wire for 120 Volt, 60 Hz control circuits shall be minimum No. 14 AWG stranded copper, NEC type MTW/THHN with 600 Volt insulation, and minimum 90 degree C rating. AC power wiring shall be 12AWG minimum. Internal wiring for panels controlling 4160 volt equipment, main pumps, blowers, switchgear. etc. shall be wired using 14 AWG tinned copper SIS wire. Wiring for current transformer circuits shall be 10 AWG tinned copper SIS and shall be yellow. Wiring for potential transformer circuits shall be 12 AWG SIS.

O. Wire for 24 volt DC Signals shall be minimum No. 16 AWG stranded tinned copper, shielded twisted pairs. Where terminated or connected, the end of the jacket and shield shall be sealed with heat shrink tubing.

P. All AC and DC control and power wiring as well as all signal wiring, shall be tagged on both ends. Where contract documents have not specified wire numbers, the wire numbering scheme from the approved shop drawings shall be used. Terminals on panel terminal blocks shall be identified with a terminal block number and terminals shall be in sequential order.

Q. Instrument transmission and control wires and associated panel terminal shall be identified with the instrument tag number, function, and polarity.

R. Indicating lights color shall be as follows:

COLOR	**FUNCTION**
RED	RUNNING, BREAKER CLOSED
RED (FLASHING)	ALARM
GREEN	MOTOR OFF, BREAK OPEN, VALVE CLOSED
WHITE	CONTROL POWER ON

S. Where indicated or required by codes, all panels and panel mounted equipment shall be explosion proof .

2.03 POWER DISTRIBUTION

A. Electrical power shall be distributed throughout the panel and field instrumentation requiring 120 VAC, 60 Hz, by means of a power distribution panel or individual fuses. There shall be a common power disconnect switch.

B. The number of circuit breakers or fuses shall depend upon the process functional requirements. The circuit breakers shall be arranged in neat functional groups so that an overload or short circuit inside the panel shall disable only a part of the process. As a minimum, circuits pertaining to one piece of equipment shall be fused or protected separately to allow servicing of that piece of equipment without affecting others.

C. Surge protectors and power conditioners shall be provided for all electronic equipment located inside the panel. To provide protected power at a level that is safe for all connected equipment.

D. An additional 120 vac duplex receptacle shall be provided in any panel or enclosure which contains equipment that requires programming or calibration. This shall be for powering laptop computers and test equipment only.

2.04 LIGHTING

A. Panels with any dimension 48 inch or greater or a depth in excess of 12 inch shall have internal lighting. Fluorescent lighting shall be used unless it will have a detrimental effect on enclosed equipment. A SPST toggle switch or door actuated switch and lighting fixtures with lamps shall be provided as required to illuminate the entire panel interior.

2.05 GROUNDING

A. Each panel mounted device shall be bonded or otherwise grounded to the subpanel on which it is mounted by means of machine threaded screws with locknuts, lock washers or other pressure mounting methods.

B. Each panel shall be provided with at least two copper ground busses, one for AC instrument power (normally 115 VAC 60 Hz) grounds and one for DC signal grounds. The DC ground bus must be electrically isolated from the panel board.

C. The DC ground bus shall be connected to a remote grounding rod by means of an independently run #2 AWG insulated copper ground wire.

D. Ground busses shall be minimum 1/4 inch x 1 inch x 8 inch with two (#2/0) AWG lugs for connection to plant grounding system. These grounding busses shall be predrilled for connection of instrument, panelboard, or cable shield connection.

E. When panel or field wiring for electronic instruments is specified shielded, a shield terminal shall be provided for each control loop at the terminal strip connection to and from field instruments. Shields shall be connected through the field terminal strip and continued to the equipment connection. Each shield shall be grounded at one point only, and this ground connected to the DC ground bus in the panels or as required by the equipment manufacturer.

F. Subpanels for mounting of internal equipment, enclosure doors and all internal metal objects shall be grounded by means of a #10 AWG bonding jumper.

2.06 CONTROL LOGIC

A. Control logic shall be performed using relays as indicated and required. When not so indicated, logic shall be performed using hardwired relay logic.

B. The control logic for fan/damper control, stop/start operation of heating and ventilating units, dehumidification units, Supply and Exhaust fans shall be implemented using relay logic as indicated

2.07 ENCLOSURE MATERIALS, TEMPERATURE CONTROL AND AREA CLASSIFICATION

A. Enclosures located inside electrical equipment rooms, administrative areas or air conditioned control rooms in non contaminated areas as well as floor standing panels containing an OIT, shall have a minimum of a NEMA 12 rating and shall be corrosion resistant. Corrosion resistant enclosures shall be made of 316 SS, or steel, coated with a powdered resin which is heat-cured 100% solid thermosetting epoxy.

B. All enclosures containing heat generating equipment shall include integrally mounted fans to circulate the air within the enclosure and remove heat from the modules. Enclosures and doors shall be designed to dissipate heat through their exterior surfaces into the plant environment. Air shall not be exchanged between the enclosure's interior and the outside environment. Alternatively, cooling air can be drawn from non-contaminated area.

C. Enclosures and panels located in areas where chlorine liquids or gasses are handled stored or transported, shall be fabricated out of a material suitable for use in such an atmosphere. Material selection shall be approved by the Engineer.

2.08 CONTROL, SELECTOR AND PUSH BUTTON SWITCHES

A. Switches and push-button type operators shall be rated for the enclosure in which they are mounted. As a minimum, all devices shall be NEMA 12 and 13, oil and water tight. Switches and operators mounted in NEMA 4X panels shall have a NEMA 4X rating. All operators used on the project shall be from one manufacturer and shall be the same line.

B. Devices shall be of the 30.5 mm type rated for extra heavy duty service.

C. Selector switches shall have gloved hand operating handles.

D. Push buttons shall be of the guarded type except those being used for stop control.

E. Emergency stop push buttons shall be Push - Pull type with maintained contacts.

F. Control and selector switches for control of 5 KV equipment and circuit breakers shall be switchgear duty control switches General Electric SB1, SBM or approved equal. Circuit Breaker trip control switches shall have 2 parallel contacts. Close switches shall have 2 series contacts. Normal after close and normal after trip contacts shall be provided.

2.09 INDICATING LIGHTS

A. Indicating lights shall be 120 volt transformer type, with replaceable high intensity L.E.D. type lamp, unless otherwise noted.

B. Indicating lights shall be rated for the enclosure in which they are mounted. As a minimum, all devices shall be NEMA 12 and 13, oil and water tight. Indicating lights mounted in NEMA 4X panels shall have a NEMA 4X rating. All indicating lights used on the project shall be from the same manufacturer as the operators specified above and shall be the same line.

C. Devices shall be of the 30.5 mm type rated for extra heavy duty service.

D. Indicating lights shall be push to test type. The push to test feature shall not interact with any other circuitry.

2.10 RELAYS

A. General purpose control relays shall be the socket mounted type for DIN rail mounting. Relays shall be tube socket or quick connect square base type. Miniature relays are not acceptable. Each relay shall have a minimum of two or three single pole double throw contacts each rated 5 or 10 amps as required. The relays shall have a push to test feature and a coil indicating light. Potter & Brumfield KRP, KUP, or approved equal

B. Relays used for control of motors shall have a horsepower rating above that of the connected motor at the appropriate voltage. Motor overload protection shall be provided.

C. Relays used for emergency shutdown and safety circuits, those common to several pieces of equipment and all relays associated with control or monitoring of 5 KV equipment shall be 4 pole (min.) 600 volt machine tool type. Contacts shall be convertible type with a 10 amp minimum ratings. These units shall be Allen-Bradley class 700 P, or approved equal.

D. Relays used for control of 5 KV or higher circuit breakers shall be utility grade switchgear control relays having the proper AC and DC ratings. These units shall be General Electric type HGA, HFA, or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. All panels and enclosures shall be mounted straight, level and parallel to building surfaces.

B. Wall mounted panels and enclosures shall be securely mounted to walls or columns as indicated. They shall be spaced a minimum of 3/4 inch from the structure using strut or plates.

C. Stand mounted units shall be supported using steel channel securely mounted to the floor with a minimum of four 1/2 inch stainless steel bolts. Stands shall be secure and level, shall easily support the mounted equipment and shall hold the equipment rigidly.

D. All free standing control panels shall be installed on a 6 inch wide and 4 inch high reinforced concrete curb with chamfered corners. The curb shall be 1 inch larger than the panel on all sides.

E. When panels or enclosures are installed on raised computer type floors, additional supports and bracing shall be provided under the floor as required to prevent the floor from being overloaded. Large and/or heavy panels having any dimension larger than 72 inches or weighing 300 lbs or more or where the weight of the completed panel exceeds 80% of the specified load bearing capacity of the flooring, shall be supported from the structural sub floor independently of the raised floor. Provide a welded steel support framework the size of the unit footprint capable of rigidly supporting the weight of the entire panel with a 50% safety factor. The floor system shall be installed flush and level with this frame. Load and bracing calculations shall be submitted for review.

It shall be the responsibility of this Contractor to coordinate floor installation requirements with the appropriate Contractor. In areas where floor modifications are required, and the floor has already been installed, the Contractor shall retain the services of an approved flooring subcontractor to make the appropriate modifications at no additional cost to the owner.

END OF SECTION 15911

SPECIFICATION 15951

TESTING, ADJUSTING AND BALANCING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to perform testing, adjusting and balancing of all Heating, Ventilation and Air Conditioning Systems as specified or required for proper operation.

1.02 PAYMENT

A. Payment for work furnished and installed under this Section shall be as specified in the Specifications.

1.03 REFERENCES

A. Reference Standards: Comply with applicable provisions and recommendations of the following except as shown or specified:

1. ASHRAE (American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc.), Systems Volume, Latest Edition.

2. Test, adjust and balance systems in accord with:

a. Associated Air Balance Council (AABC): National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems (AABC-MN-1).

b. National Environmental Balancing Bureau (NEBB): Procedural Standards for Testing Adjusting Balancing of Environmental Systems (NEBB-01).

c. AABC "National Standards for Field Measurements, Total System Balance, Air Distribution, Hydronics Systems, Volume One Number 81266".

1.04 SUBMITTALS

A. Contractor shall submit working drawings, shop drawings and material specifications for the approval of the Engineer in accordance with the requirements of the Division 1 - General Requirements of the Specifications.

B. Data Sheets:

1. Submit samples of data sheets on each item of equipment for approval.

2. Submit data sheets on each item of testing equipment required.

3. Include name of device, manufacturer's name, model number, latest date of calibration, and correction factors.

C. Report Forms:

1. Submit specimen copies of report forms for Engineer's approval.

2. Forms shall be 8-1/2 by 11-inch paper for looseleaf binding, with blanks for listing of the required test ratings and for certification of report.

3. Reports shall be on the organizations approved forms imprinted with the company's name.

4. Certified report outlining procedure used to balance the system and the types of measuring devices used.

D. Test results shall be submitted on approved forms in a typed format.

E. Submit certified copies of required test reports to the Engineer for approval.

1.05 QUALITY ASSURANCE

A. Balancers Qualifications:

1. Submit work experience or resume of proposed biographical data on employee who will directly supervise the Testing, Adjusting and Balancing Work.

2. Submit proof of certification by NEBB (National Environmental Balancing Bureau), AABC (Associated Air Balance Council), or SMACNA (Sheet Metal and Air Conditioning Contractors' National Association), or demonstrate that the standards and experience required for certification are possessed, all to the satisfaction of the Engineer.

3. Submit a record of at least 5 years' experience in the testing and balancing contracting industry, engaged in heating, ventilating, and air conditioning work.

1.06 JOB CONDITIONS

A. In accordance with the requirements of Division 1 of the Specifications, heating, ventilating, air conditioning equipment shall be completely installed and in continuous operation as required to accomplish the test, adjust and balance work specified.

B. Reports shall be certified by the testing engineer that the methods used and the results achieved are as specified.

1.07 CORRECTIVE ADJUSTMENTS

A. Should corrective measures caused by faulty installation require retesting, adjusting and balancing, such work shall be performed at no additional expense to the owner.

B. Inspections:

1. Fan Belt Deflection: No less than 1/4-inch or more than a 1/2-inch.

2. Finned Coils: Plate type fins shall be combed out with a fin comb for appropriate fin spacing. Helical fins shall be straightened with blunt bladed instrument.

PART 2 PRODUCTS

2.01 INSTRUMENTS: GENERAL

A. Contractor shall provide all necessary instrumentation, tools, ladders, etc. to complete all air balancing tests and adjustments.

B. Instrumentation shall be in accordance with NEBB, AABC, or SMACNA requirements and shall be calibrated to the accuracy standards demanded by these organizations.

C. Flow-measuring hoods (manufactured, not fabricated) shall be acceptable for measurement of ceiling diffuser performance only.

D. Contractor shall assume full responsibility for safe keeping of all instrumentation during the course of work.

2.02 AIR BALANCE INSTRUMENTS

A. Provide all velometers, anemometers, pitot tubes, differential air pressure gages, manometers, hook gages, static pressure probe units, etc. as may be required to perform all air balance tests of HVAC equipment, ducts, registers, grilles, etc.

2.03 SYSTEM PERFORMANCE MEASURING INSTRUMENTS

A. Provide insertion thermometers, sling psychrometers, tachometers, revolution counters, clamp-on volt-ammeter recorders, and other instruments as required to measure all facets of the complete HVAC system performance.

PART 3 EXECUTION

3.01 GENERAL

A. All testing, adjusting, and balancing of air systems shall be performed in compliance with the standard procedure manual published by the testing, adjusting, and balancing organization affiliated with the Contractor. Contractor shall submit one copy of the standard procedure manual to the Engineer for his records.

B. Contractor shall be solely responsible for the protection and safeguarding of his work and shall provide every protection against accidents, injury, and damage to persons and property.

C. Contractor shall keep dust, dirt, and debris to an absolute minimum and reinstall all removed ceiling components to their original positions at the end of each day.

D. Contractor shall be fully responsible for removal and reinstallation of ceiling system and replacement of any component damaged.

E. Contractor shall install additional access panels at no extra cost to the owner, as is required to gain access to equipment concealed above ceilings, behind walls, or any other concealed space.

F. Air systems shall be tested, adjusted, and balanced with clean filters.

3.02 INSPECTION

A. The Contractor shall conform to the requirements of Division 1 of the Specifications.

B. Equipment Check:

1. Verify proper overload heater sizes.

2. Verify function of safety and operating controls.

3. Verify proper operation of equipment.

4. Report on inspection, observation and checking procedures.

3.03 PREPARATION

A. Prepare a TAB plan that includes the following:

1. Equipment and systems to be tested.

2. Strategies and step-by-step procedures for balancing the systems.

3. Instrumentation to be used.

4. Sample forms with specific identification for all equipment.

B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:

1. Airside:

a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.

b. Duct systems are complete with terminals installed.

c. Dampers are open and functional.

d. Fans are operating, free of vibration, and rotating in correct direction.

e. .

f. Automatic temperature-control systems are operational.

g. Ceilings are installed.

h. Windows and doors are installed.

i. Suitable access to balancing devices and equipment is provided.

3.04 TESTING OF PIPING, EQUIPMENT AND DUCT

A. In addition to any other references to testing specified in Division 1, the Contractor shall be bound by this section of the Specification to test and adjust all systems and accessories covered under this Contract. The Contractor shall also comply with the requirements of testing as outlined in the individual sections. Furthermore, he shall operate and maintain these systems for certain periods of time as specified herein, and shall leave them in good working order. The Contractor shall provide all necessary equipment and labor for this work.

B. Refrigerant piping must be tested before any piping is insulated or concealed. The entire refrigerant circuit must be thoroughly tested to be sure that it is absolutely tight. The system shall be tested with oil pumped, dry nitrogen. The low side of the system shall be tested at 150 psi and the high side at 300 psi. All pipe joints shall be tapped sharply with a rubber mallet and tested for leaks with a soap solution. After all leaks have been repaired, the system shall be charged with a small quantity of refrigerant and the entire system shall be checked with a halide leak detector. Once the system is found tight, it shall be allowed to stand for 6 hours with the pressure on. If any pressure drop occurs, except those due to changes in ambient temperature, the entire system shall be retested. The system shall be evacuated with a vacuum pump until vacuum of 2.5 mm Hg is achieved. Under no circumstances shall the compressor be used to evacuate the system. After evacuation, the system shall be allowed to stand for 12 hours. If no noticeable rise in pressure occurs, the system shall be charged.

C. All ductwork systems including air outlets shall be tested, adjusted and balanced for within limits of the required airflows as indicated on Drawings and specified in this Section.

D. After all final tests have been performed on all equipment and on all sub-systems installed under this Contract, including the testing of all controls specified in other Sections, and after the results from all such testing have been accepted, the Contractor shall test the overall system by demonstrating its ability to respond

properly to normal changes in controlled parameters, as well as to system upsets. To facilitate this, he shall make available a minimum of two men, thoroughly familiar with the systems and equipment installed under this Contract, for a minimum of seven (7) days to test the system by changing controlled parameters and generating system upsets as directed by the Engineer, and demonstrating that the sequential action appropriate to the particular change or upset occurs automatically. Where actual change or upset is not feasible, the Contractor shall simulate the change or the upset. Controlled parameter changes shall include, but not necessarily be limited to, any change in temperature, pressure, flow rate, fluid level, load, etc., which should result in an automatic change in the position of a control valve or control damper, in the output rate of a piece of equipment, in the normal start-up or shutdown of equipment, etc. The change in the state of the controlled device or equipment shall be shown to result in a corrective action on the controlled parameter. Upsets shall include, but not necessarily be limited to, any condition which should cause annunciation of an alarm, safety shutdown of equipment, startup of standby equipment, closing of fusible-link devices, lifting of relief valves, etc. The Contractor shall immediately restore to its original state any safety device, the state of which has been changed by its having been tested.

E. Contractor shall immediately correct any system deficiency that should come to light during testing.

F. After the overall system testing has been completed, and after all final adjustments have been made, the Contractor shall operate and maintain all new systems and equipment, site-wide, associated therewith, for a period of thirty consecutive days. During this period all normal maintenance (filter replacements, strainer cleaning, periodic checks of safety devices, datalogging, etc.) shall be performed by the Contractor. If, during this period, any work beyond routine maintenance of equipment and materials installed under this Contract, should be required to maintain proper operation of the overall system, the elapsed time shall be forfeited, and a new thirty day period shall commence following the completion of the corrective action.

3.05 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' Record drawings duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

D. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

E. Verify that motor starters are equipped with properly sized thermal protection.

F. Check dampers for proper position to achieve desired airflow path.

G. Check for airflow blockages.

H. Check for proper sealing of air-handling-unit components.

3.06 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

a. Set outside-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.

b. Where duct conditions allow, measure airflow by main Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses close to the fan and prior to any outlets, to obtain total airflow.

c. Where duct conditions are unsuitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.

2. Measure fan static pressures as follows:

a. Measure static pressure directly at the fan outlet or through the flexible connection.

b. Measure static pressure directly at the fan inlet or through the flexible connection.

c. Report artificial loading of filters at the time static pressures are measured.

3. Review Contractor-prepared shop drawings and Record drawings to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.

4. Obtain approval from Owner for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.

5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Verify final system conditions.

1. Re-measure and confirm that minimum relief airflows are within design. Readjust to design if necessary.

2. Re-measure and confirm that total airflow is within design.

3. Re-measure all final fan operating data, speed, volts, amps, and static profile.

4. Mark all final settings.

5. Test system in economizer mode. Verify proper operation and adjust if necessary.

6. Measure and record all operating data.

7. Record final fan-performance data.

3.07 PROCEDURES FOR MOTORS

A. Motors 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.

2. Motor horsepower rating.

3. Motor rpm.

4. Phase and hertz.

5. Nameplate and measured voltage, each phase.

6. Nameplate and measured amperage, each phase.

7. Starter size and thermal-protection-element rating.

8. Service factor and frame size.

B. Motors Driven by Variable-Frequency Controllers: Test manual bypass of controller to prove proper operation.

3.08 VIBRATION TESTS

A. After systems are balanced and Substantially Completion, measure and record vibration levels on equipment having motor horsepower equal to or greater than 10.

B. Instrumentation:

1. Use portable, battery-operated, and microprocessor-controlled vibration meter with or without a built-in printer.

2. The meter shall automatically identify engineering units, filter bandwidth, amplitude, and frequency scale values.

3. The meter shall be able to measure machine vibration displacement in mils of deflection, velocity in inches per second, and acceleration in inches per second squared.

4. Verify calibration date is current for vibration meter before taking readings.

C. Test Procedures:

1. To ensure accurate readings, verify that accelerometer has a clean, flat surface and is mounted properly.

2. With the unit running, set up vibration meter in a safe, secure location. Connect transducer to meter with proper cables. Hold magnetic tip of transducer on top of the bearing, and measure unit in mils of deflection. Record measurement, then move transducer to the side of the bearing and record in mils of deflection. Record an axial reading in mils of deflection by holding nonmagnetic, pointed transducer tip on end of shaft.

3. Change vibration meter to velocity (inches per second) measurements. Repeat and record above measurements.

4. Record CPM or rpm.

5. Read each bearing on motor, and fan as required. Track and record vibration levels from rotating component through casing to base.

D. Reporting:

1. Report shall record location and the system tested.

2. Include horizontal-vertical-axial measurements for tests.

3. Verify that vibration limits follow Specifications, or, if not specified, follow the General Machinery Vibration Severity Chart or Vibration Acceleration General Severity Chart from AABC's "National Standards for Total System Balance." Acceptable levels of vibration are normally "smooth" to "good."

4. Include in General Machinery Vibration Severity Chart, with conditions plotted.

3.09 HVAC CONTROLS VERIFICATION

A. In conjunction with system balancing, perform the following:

1. Verify HVAC control system is operating within the design limitations.

2. Confirm that the sequences of operation are in compliance with Contract Documents.

3. Verify that controllers are calibrated and function as intended.

4. Verify that controller set points are as indicated.

5. Verify the operation of lockout or interlock systems.

6. Verify the operation of valve and damper actuators.

7. Verify that controlled devices are properly installed and connected to correct controller.

8. Verify that controlled devices travel freely and are in position indicated by controller: open, closed, or modulating.

9. Verify location and installation of sensors to ensure that they sense only intended temperature, humidity, or pressure.

B. Reporting: Include a summary of verifications performed, remaining deficiencies, and variations from indicated conditions.

3.10 BALANCING AND ADJUSTING

A. In addition to any other reference to balancing and adjusting specified elsewhere in these specifications, the Contractor shall be bound by this portion of the specifications to balance, adjust and leave in good working order all systems and accessories covered under this Contract.

B. The Contractor shall procure the services of an independent balancing and testing agency which specializes in the balancing and testing of heating, ventilating and air conditioning systems to balance, test and adjust all systems installed under this Section.

C. The Contractor shall advise the Engineer at least two weeks in advance of the date scheduled for balancing to commence; at the Engineer's discretion, the balancing shall be conducted in the Engineer's presence.

D. At least three (3) months prior to the commencement of balancing, the Contractor shall forward a detailed explanation of the balancing procedure to the Engineer for review. In general, the method shall conform to those specified by the Associated Air Balance Council or SMACNA.

E. All piping systems shall be balanced under this Section to provide the flows indicted on the Contract Drawings or in the Specifications.

F. Air systems shall be balanced before all refrigerant systems.

G. Before beginning to balance the air systems the Contractor shall check, in the presence of the Engineer, all filters and coils for cleanliness, dampers (automatic, volume and fire) for correct position, all fans for proper rotation, and temperature controls for minimum completeness to allow for proper balancing. If any of the above or other conditions are found which would not allow for proper balancing the Contractor shall take the necessary corrective actions, at his own expense, before balancing begins.

H. All heating, ventilating, and air conditioning systems shall be balanced by the Contractor by adjustment of dampers, fan sheaves, apparatus and air outlets to provide the air quantities indicated on the Contract Drawings, including the adjustments of air outlets in order to eliminate drafts. If necessary, balancing shall be accomplished by replacement of fan sheaves.

I. Balancing for all air systems shall be accomplished in a manner to first minimize throttling losses, then fan speed shall be adjusted to meet design conditions.

J. The Contractor shall submit all recorded data to Engineer for review.

K. All equipment, including but not limited to air outlets, fans, , etc., shall be shall be balanced within +10%/-5% of the specified design capacity.

L. The Contractor shall adjust any or all equipment which, in the owner's opinion, is not set within acceptable limits.

3.11 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.

2. Include a list of instruments used for procedures, along with proof of calibration.

3. Certify validity and accuracy of field data.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Fan curves.

2. Manufacturers' test data.

3. Field test reports prepared by system and equipment installers.

4. Other information relative to equipment performance; do not include Shop Drawings and Product Data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.

2. Name and address of the TAB specialist.

3. Project name.

4. Project location.

5. Architect's name and address.

6. Engineer's name and address.

7. Contractor's name and address.

8. Report date.

9. Signature of TAB supervisor who certifies the report.

10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.

11. Summary of contents, including the following:

    a. Indicated versus final performance.

    b. Notable characteristics of systems.

    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.

13. Data for terminal units, including manufacturer's name, type, size, and fittings.

14. Notes to explain why certain final data in the body of reports vary from indicated values.

15. Test conditions for fans performance forms, including the following:

    a. Settings for outdoor-air and exhaust-air dampers.

    b. Fan drive settings, including settings and percentage of maximum pitch diameter.

c. Other system operating conditions that affect performance.

16. Minimum information for equipment:

a. Room or facility served.

b. Size, quantity and model of equipment.

c. Type of equipment.

d. Air flow indicated on Contract Drawings.

e. Air flow measured.

f. Fan cfm indicated on the Contract Drawings.

g. Fan cfm measured.

h. Fan motor running amps.

D. System Diagrams: Include schematic layouts of air distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, and exhaust airflows.

2. Balancing stations.

3. Position of balancing devices.

E. Fan Test Reports: For exhaust fans, include the following:

1. Fan Data:

a. System identification.

b. Location.

c. Make and type.

d. Model number and size.

e. Manufacturer's serial number.

f. Arrangement and class.

g. Sheave make, size in inches, and bore.

h. Center-to-center dimensions of sheave and amount of adjustments in inches.

2. Motor Data:

    a. Motor make, and frame type and size.

    b. Horsepower and speed.

    c. Volts, phase, and hertz.

    d. Full-load amperage and service factor.

    e. Sheave make, size in inches, and bore.

    f. Center-to-center dimensions of sheave and amount of adjustments in inches.

    g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

    a. Total airflow rate in cfm.

    b. Total system static pressure in inches wg.

    c. Fan speed.

    d. Discharge static pressure in inches wg.

    e. Suction static pressure in inches wg.

F. Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

    a. System fan number.

    b. Location and zone.

    c. Traverse air temperature in deg F.

    d. Duct static pressure in inches wg.

    e. Duct size in inches.

    f. Duct area in sq. ft..

    g. Indicated airflow rate in cfm.

    h. Indicated velocity in fpm.

i. Actual airflow rate in cfm.

j. Actual average velocity in fpm.

k. Barometric pressure in psig.

G. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.

b. Serial number.

c. Application.

d. Dates of use.

e. Dates of calibration.

3.12 AUTOMATIC CONTROL SYSTEMS

A. In cooperation with the control manufacturer's representative, set and adjust automatically operated devices to achieve required sequence of operations.

B. Testing organization shall verify all controls for proper calibration and list those controls requiring adjustment by control system installer.

3.13 MARKING OF SETTING

A. Following approval of testing, adjusting and balancing (TAB) Verification Report, the setting of all HVAC adjustment devices including valves, and manual dampers shall be permanently marked by the TAB Specialist so that adjustment can be restored if disturbed at any time.

3.14 IDENTIFICATION OF TEST PORTS

A. The TAB Specialist shall permanently and legibly identify the location points of duct test ports. If the ductwork has exterior insulation, the identification shall be made on the exterior side of the insulation. All penetrations through ductwork and ductwork insulation shall be sealed to prevent air leakage or to maintain integrity of vapor barrier.

END OF SECTION 15951

SECTION 16010

BASIC ELECTRICAL REQUIREMENTS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Basic Electrical Requirements specifically applicable to Division 16 Sections, in addition to Division 1 - General Requirements.

1.02 REFERENCES

A. The following standards shall also be referenced for additional requirements. Where discrepancies arise between the Utility standards and these specifications, the more stringent requirement shall apply.

1. SJCUD Approved Materials and Checklist
2. SJCUD SCADA System Standards
3. FPL Electric Service Standards

1.03 SCOPE

A. This scope covers the furnishing, installation, testing, adjusting and placing in operation all electrical equipment, devices, facilities, materials, and auxiliary items necessary for the complete and successful operation of all electrical equipment as herein described, shown on the plans, or deemed necessary for the completion of the electrical portion of the project. It is the intent of Division 16 to outline the electrical requirements of the contract in order to provide the information necessary for the construction of a fully operational system as shown on the plans and as herein described. A comprehensive electrical scope of work is as follows:

1. Power/electrical system
2. Instrumentation and Control Systems
3. Lighting system
4. Lightning protection system
5. Grounding system
6. Connection of electrically powered mechanical equipment
7. Temporary construction power
8. All incidentals necessary for a complete and fully operational electrical system.

1.04 WORKING CLEARANCES

A. Working clearances around equipment requiring electrical services shall be verified by CONTRACTOR to comply with NEC requirements. Should there be apparent violations of clearances; the CONTRACTOR shall notify the ENGINEER before proceeding with connection or placing of equipment.

B. In the case of panelboards, safety switches and other equipment requiring wire and cable terminations, the CONTRACTOR shall ascertain that lug sizes and wiring

gutters, or space allowed for proper accommodation and termination of the wires and cables are adequate.

1.05 SAFETY EQUIPMENT

A. CONTRACTOR shall provide, at the completion of the project and prior to turnover to OWNER, electrical equipment safety mats around each piece of interior electrical equipment with a voltage to ground greater than 50 volts. Mats shall be ¼-inch thick type 11 class 2, with a max voltage of 17,000 volts AC RMS. Mats shall meet ozone, flame, and oil resistance requirements.

1.06 WORKMANSHIP

A. Workmanship under this Division shall be accomplished by persons skilled in the performance of the required task. All work shall be done in keeping with conventions of the trade. Work of this Division shall be closely coordinated with work of other trades to avoid conflict and interference.

1.07 PROTECTION OF ELECTRICAL EQUIPMENT

A. Electrical equipment shall be protected from the weather, especially from water dripping or splashing upon it, at all times during shipment, storage and after installation. Should any apparatus be subjected to possible injury by water, it shall be replaced, at the expense of the CONTRACTOR. The results of the test shall be submitted to the ENGINEER and if the apparatus is found to be unsuitable, the CONTRACTOR shall replace it without additional cost to the OWNER.

B. Electrical equipment space heaters and motor space heaters shall be energized during storage periods and prior to being placed into operation to prevent moisture and condensation from damaging internal components.

C. Where indicated on the contract drawings, the CONTRACTOR shall supply a lockable steel cabinet for storing all project spare parts as listed and required within these specifications. Cabinet shall be sized sufficiently to house the spare parts plus an additional 20 percent spare capacity.

1. Cabinets located within conditioned spaces shall be NEMA1.
2. Cabinets located in unconditioned spaces shall be NEMA 12.
3. No cabinets shall be installed in hazardous areas.

1.08 UTILITIES

A. The electrical CONTRACTOR shall install a fully operational electrical service as described in the plans.

B. Arrange with the utility company for the services and install the services in accordance with their requirements, regulations, and recommendations.

C. The CONTRACTOR shall be responsible for purchasing, furnishing, and installing all equipment required by the utility company.

D. The CONTRACTOR shall be responsible for all costs required by the utility company associated with the installation of electrical service.

E. The CONTRACTOR shall be responsible for all costs required by the utility company associated with the demolition of the existing electrical service.

1.09 WARRANTY

A. CONTRACTOR shall warranty all lighting for a period of one year after substantial completion. Warranty shall include material and labor for re-lamping.

B. The CONTRACTOR shall warranty all other electrical systems, materials and unless otherwise noted, workmanship to be free from defects for a period of one year from the date of substantial completion. He shall correct all defects arising within this period upon notification by the OWNER or ENGINEER, without additional compensation.

C. It is understood that the rights and benefits given the OWNER by the warranties found in the technical specifications are in addition to and not in derogation of any rights or benefits found in the special and general provisions of the contract.

1.10 TEMPORARY POWER AND LIGHTS DURING CONSTRUCTION

A. It shall be the responsibility of the CONTRACTOR to provide and maintain adequate temporary power and lighting at all times during construction, so that the various other trades can accomplish their work in a flawless manner and to maintain at all times plant operations. Particular attention will be given to power and lighting for masonry, drywall, painting, tile work and any other finish work.

1.11 MATERIAL

A. Material shall be new and comply with standards of Underwriters' Laboratories, Inc., where standards have been established for the particular product and the various NEMA, ANSI, ASTM, IEEE, AEIC, IPCEA or other publications referenced.

B. Unless specifically noted, all electrical equipment and materials (Generators, Automatic Transfer Switches, Panelboards, Switchboards, Disconnects, lighting, Instruments, Control Panels, Motors, Wire, Fasteners, Etc.) that may be shown as to be removed are the property of the OWNER and shall be returned to the OWNER within 1 week. The equipment and materials shall be handled with care and returned to the OWNER in the condition they are found, photos shall be provided upon request to establish condition of items valued over $100 new.

1.12 TEST EQUIPMENT

A. The CONTRACTOR shall provide all test equipment and supplies deemed necessary by the ENGINEER at no extra cost to the OWNER. These supplies shall include but not be limited to the following: volt meters, amp meters, clamp-on ground rod test meter, light meters, generator load banks and temporary cables, watt meters, harmonic distortion test equipment, thermal image camera, megger tester, high pot test equipment, power quality analyzers, recording power meter, and oscilloscopes.

1.13 REFERENCES

A. ANSI/NFPA 70 – National Electrical Code.

B. ANSIC2 – National Electrical Safety Code.

C. NEMA – National Electrical Manufacturer's Assoc.

D. UL – Underwriters Laboratories

E. NFPA – National Fire Protection Assoc.

F. IEEE – The Institute of Electrical and Electronics Engineers

G. IESNA – The Illuminating Engineering Society of North America

H. NETA – International Electrical Testing Association

I. API – American Petroleum Institute

J. AGA – American Gas Association

K. Recommended Standards for Water Works and Wastewater Facilities (10 State Standards) as published by Great Lakes – Upper Mississippi River Board of State Public Health and Environmental Managers.

1.14 SUBMITTAL

A. Submit under provisions of Section 01300 the following certification:

1. The CONTRACTOR installing all electrical work shall review and approve all electrical shop drawings prior to submittal to the ENGINEER for review. As part of the review, the installer shall certify the following:

a. I hereby certify that the (equipment) (material) (article) shown and marked in this submittal is in compliance with the contract drawings and specifications, can be installed in the allocated space, will be stored in accordance with the manufacturer’s recommendation, will be installed per NEC, and is submitted for approval.
Certified by: _____ Date: _____

b. Contractor shall state clearly in each submittal any deviations from the contract documents, referencing applicable specification sections and reasoning for deviation. Deviations are contingent upon ENGINEER review and approval.

B. Submit shop drawings and product data grouped to include complete submittal of related systems, products, and accessories in a single submittal to the requirements of Section 01300. No electrical work may be performed until shop drawings are approved. Submit shop drawings in accordance with the requirements of the respective division 16 specification section included as part of these project documents. Included are such things as:

1. Low Voltage Power/Electrical System

a. Generator
b. Automatic Transfer Switch
c. Panelboards
d. Motor controllers
e. Power distribution equipment
f. Conduit and Conduit Fittings
g. Wire
h. Pull Boxes

i. Circuit Breakers
j. Disconnects
k. Fuses
l. Conduit Support Systems
m. Wiring Devices
n. Transformers
o. Surge Protection Equipment
p. Arc Flash Study
q. Breaker Coordination Study (BREAKERS OR FUSES WILL NOT BE APPROVED WITHOUT AN APPROVED COORDINATION STUDY)

2. Lighting System
   a. All Light Fixtures
      i. Computer Printout of Lighting Layout
      ii. Sample Fixture (as directed by ENGINEER)
      iii. IES Photometric Files
   b. Poles and Foundations
3. Miscellaneous Electrical Equipment
   a. Miscellaneous Electrical Parts
4. Drawings
   a. Coordination drawing of all electrical areas
   b. Conduit layout drawings
   c. Duct drawings
   d. As-Built Drawings
5. Delegated Engineering
   a. Lightning Protection System
      i. Drawings provided as part of this CONTRACT are diagrammatic in nature and intended for bidding purposes only. The CONTRACTOR shall contract with a SUBCONTRACTOR who is a member of the Lightning Protection Institute and certified by LPI to design and install lightning protection systems in accordance with LPI Standard 175 and NFPA 780.
   b. Fire Suppression System
      i. Drawings provided as part of this CONTRACT are diagrammatic in nature and intended for bidding purposes only. The CONTRACTOR shall contract with a SUBCONTRACTOR who is a licensed fire alarm contractor by the State of Florida and experienced with Potter fire alarm systems. The delegated Fire Alarm Engineer shall design and install the complete fire alarm system and components in accordance with current edition of FBC, NFPA, OWNER Standards, and local AHJ requirements. All delegated engineering shall be signed and sealed by a Florida P.E.
   c. Light Pole Foundations

i. The design for light poles and bases shown on this sheet are a basis of design to be considered by a delegate engineer of record in accordance with F.A.C. 61G15-30.006 and 61G15-31. The contractor shall provide the design to be performed by a delegate engineer of record. Submit the delegated engineering documents with shop drawings for approval.

d. Mark dimensions and values in units to match those specified.

1.15 REGULATORY REQUIREMENTS

A. Conform to applicable sections of the Building Code and all local rules, regulations and ordinances.

B. Obtain permits and request inspections from authority having jurisdiction.

C. Electrical: Conform to NFPA 70 & National Electric Safety Code

1.16 FINAL INSPECTION AND TESTING

A. After the electrical installation is complete, the CONTRACTOR shall deliver to the ENGINEER the following information with his request for final inspection.

1. One set of contract drawings marked to show all significant changes in equipment ratings and locations, alterations in locations of conduit runs, or of any data differing from the contract drawings. This shall include revised or changed panelboard and switchgear schedules.

2. Certificates of final inspection from local authority.

3. A tabulation of all motors listing their respective manufacturer, horsepower, nameplate voltage and current, actual running current after installation and overload heater rating.

B. The electrical work shall be thoroughly tested to demonstrate that the entire system is in proper working order and in accordance with the plans and specifications. Each motor with its control shall be run as nearly as possible under operating conditions for a sufficient length of time to demonstrate correct alignment, wiring capacity, speed and satisfactory operation. All main switches and circuit breakers shall be operated, but not necessarily at full load. CONTRACTOR may be required during final inspection, at the request of the ENGINEER to furnish test instruments for use during the testing.

C. All wiring shall be given a megger test using a 1000 Volt megger and a conductor continuity test. These tests shall be performed upon delivery to project site and after conductors are pulled, but before final connections are made. The ENGINEER shall be given two days' written notice of the anticipated test date so that he may witness the test if so desired. In any event, the CONTRACTOR shall record the circuit designation and the megger reading on each phase. This written record shall be submitted to the ENGINEER prior to energization of associated equipment. The cost of this test or any retest caused by insufficient megger readings shall be the responsibility of the CONTRACTOR (All tests shall be done in accordance with NETA Standards).

1.17 STAFFING

A. The electrical CONTRACTOR shall provide a Certified Electrical Contractor, Master Electrician, or equivalent qualification or license issued by the State in which the project resides. This qualified person shall be the Electrical Superintendent and shall be on the project site any time any electrical work is performed by the CONTRACTOR.

1.18 AS-BUILT DRAWINGS

A. The as-built drawings shall include detailed drawings of all duct banks, underground conduit, above ground conduit, power distribution equipment, PLC control panels, and control instrument drawings. The duct bank and conduit drawings shall indicate exact location of all duct banks, underground electrical wiring, and fiber optic cable.

   1. The location shall indicate the following:

      a. Centerline location
      b. Width / Cross section
      c. Depth

B. As-built drawings shall be furnished to the ENGINEER in AutoCad 2020 and PDF format.

END OF SECTION 16010

SECTION 16055

OVERCURRENT PROTECTION DEVICES ARC-FLASH STUDY

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This specification includes a computer-based, arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment.

B. The specification includes a computer based, overcurrent protective device coordination study to confirm protective device ratings and ensure coordination between upstream and downstream breakers.

C. The study shall include the entire electrical system (both existing and proposed) for each facility.

D. CONTRACTOR shall coordinate with the utility electrical service provider to obtain up to date available fault current contribution in order to prepare the documents required by this specification.

1.03 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

B. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

D. SCCR: Short-circuit current rating.

E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.04 INFORMATIONAL SUBMITTALS

A. Provide all submittals in accordance with Section 01300.

B. Qualification Data: Professional Engineer in the state of Florida.

1.05 CLOSEOUT SUBMITTALS

A. Provide all submittals in accordance with Section 01300.

B. Maintenance procedures according to requirements in NFPA 70E shall be provided in the equipment manuals.

1.06 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Arc-Flash Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. The computer program shall be developed under the charge of a licensed professional ENGINEER who holds IEEE Computer Society's Certified Software Development Professional certification in the state of Florida.

C. Arc-Flash Study Specialist Qualifications: Professional ENGINEER in charge of performing the study, analyzing the arc flash, and documenting recommendations, licensed in the state where the Project is located. All elements of the study shall be performed under the direct supervision and control of this professional ENGINEER.

PART 2 – PRODUCTS

2.01 COMPUTER SOFTWARE DEVELOPERS

A. Software Developers: Subject to compliance with requirements, provide software by one of the following:

1. SKM Systems Analysis, Inc. (Power Tools for Windows)

B. Comply with IEEE 1584 and NFPA 70E.

C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

2.02 SHORT-CIRCUIT STUDY REPORT CONTENT

A. Executive Summary.

B. Study descriptions, purpose, basis and scope.

1. One-line diagram, showing the following:

2. Protective device designations and ampere ratings.

3. Cable size and lengths.

4. Transformer kilovolt ampere (kVA) and voltage ratings.

5. Motor and generator designations and kVA ratings.

6. Switchgear, switchboard, motor-control center and panelboard designations.

C. Study Input Data: As described in "Power System Data" Article.

D. Short-Circuit Study Output:

1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

a. Voltage.
b. Calculated symmetrical fault-current magnitude and angle.
c. Fault-point X/R ratio.
d. No AC Decrement (NACD) ratio.
e. Equivalent impedance.
f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

E. Incident Energy and Flash Protection Boundary Calculations:

1. Arcing fault magnitude.
2. Protective device clearing time.
3. Duration of arc.
4. Arc-flash boundary.
5. Working distance.
6. Incident energy.
7. Hazard risk category.
8. Recommendations for arc-flash energy reduction.

F. Fault study input data, case descriptions, and fault-current calculations including a definition of terms and guide for interpretation of the computer printout.

2.03 ARC-FLASH WARNING LABELS

A. Comply with requirements in Section 16075 "Identification for Electrical Systems." Produce a 3.5-by-5-inch (76-by-127-mm) thermal transfer label of high-adhesion polyester for each work location included in the analysis.

B. The label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:

1. Location designation.
2. Nominal voltage.
3. Flash protection boundary.
4. Hazard risk category.
5. Incident energy.
6. Working distance.
7. Engineering report number, revision number, and issue date.
8. PPE required.

C. Labels shall be machine printed, with no field-applied markings.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine project overcurrent protective device submittals. Proceed with arc-flash study only after relevant equipment submittals have been assembled. New overcurrent protective devices shall not be approved until completion of the arc-flash study.

3.02 SHORT-CIRCUIT STUDY

A. Calculate short-circuit currents according to IEEE 551.

B. Base study on the device characteristics supplied by device manufacturer.

1. Service Entrance: Type XHHW-2, single conductors in raceway.

C. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for the Project. Include studies of system-switching configurations and alternate operations that could result in maximum fault conditions.

D. The calculations shall include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and shall apply to low- and medium-voltage ac systems.

E. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and single line-to-ground fault at each of the following applicable equipment:

1. Electric utility's supply termination point
2. Low-voltage switchgear
3. Motor-control centers
4. Standby generators and automatic transfer switches
5. Branch circuit panelboards
6. Control Panels

3.03 PROTECTIVE DEVICE COORDINATION STUDY

A. Perform coordination study using approved computer software program. Prepare a written report using results of fault-current study. Comply with IEEE 399.

1. Calculate the maximum and minimum 1/2-cycle short-circuit currents.
2. Calculate the maximum and minimum interrupting duty (5 cycles to 2 seconds) short-circuit currents.
3. Calculate the maximum and minimum ground-fault currents.

B. Comply with IEEE 141 and IEEE 242 recommendations for fault currents and time intervals. (Comply with NEC for selective coordination NFPA 70; 240.12, 700.27, 701.18).

C. Transformer Primary Overcurrent Protective Devices:

1. Device shall not operate in response to the following:
    a. Inrush current when first energized.
    b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
    c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.
2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.

D. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and conductor melting curves in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.

E. Coordination-Study Report: Prepare a written report indicating the following results of coordination study:

1. Tabular Format of Settings Selected for Overcurrent Protective Devices:
    a. Device tag.
    b. Relay-current transformer ratios; and tap, time-dial, and instantaneous-pickup values.
    c. Circuit-breaker sensor rating; and long-time, short-time, and instantaneous settings.
    d. Fuse-current rating and type.
    e. Ground-fault relay-pickup and time-delay settings.

2. Coordination Curves: Prepared to determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:
    a. Device tag.
    b. Voltage and current ratio for curves.
    c. Three-phase and single-phase damage points for each transformer.
    d. No damage, melting, and clearing curves for fuses.
    e. Cable damage curves.
    f. Transformer inrush points.
    g. Maximum fault-current cutoff point.

F. Provide completed data sheets for setting of overcurrent protective devices bound in a 3-ring binder.

3.04 ARC-FLASH HAZARD ANALYSIS

A. Comply with NFPA 70E and its Annex D for hazard analysis study.

B. Use the short-circuit study output and the field-verified settings of the overcurrent devices.

C. Calculate maximum and minimum contributions of fault-current size.

1. The minimum calculation shall assume that the contribution from all sources is at a minimum and shall assume no motor load.

2. The maximum calculation shall assume a maximum contribution from all sources and shall assume motors to be operating under full-load conditions.

D. Calculate the arc-flash protection boundary and incident energy at locations in the electrical distribution system where personnel could perform work on energized parts.

E. Include medium- and low-voltage equipment locations. Safe working distances shall be specified for calculated fault locations based on the calculated arc-flash boundary, considering incident energy of 1.2 cal/sq.cm.

F. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators shall be decremented as follows:

1. Fault contribution from induction motors should not be considered beyond three to five cycles.

2. Fault contribution from synchronous motors and generators should be decayed to match the actual decrement of each as closely as possible (e.g., contributions from permanent magnet generators will typically decay from 10 per unit to three per unit after 10 cycles).

G. Arc-flash computation shall include both line and load side of a circuit breaker as follows:

1. When the circuit breaker is in a separate enclosure.

2. When the line terminals of the circuit breaker are separate from the work location.

3.05 POWER SYSTEM DATA

A. Obtain all data necessary to conduct the arc-flash hazard analysis.

1. Verify completeness of data supplied on the one-line diagram on Drawings. Call discrepancies to the attention of the OWNER and ENGINEER.

2. For new equipment, use characteristics submitted under the provisions of action submittals and information submittals for this Project.

3. For existing equipment, whether or not relocated, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers.

B. Gather and tabulate the following input data to support coordination study. Comply with recommendations in IEEE 1584 and NFPA 70E as to the amount of detail that is

required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the ENGINEER in charge of performing the study.

1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Obtain electrical power utility impedance at the service.
3. Power sources and ties.
4. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in per cent, and phase shift.
5. For reactors, provide manufacturer and model designation, voltage rating and impedance.
6. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
7. Generators short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
8. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
9. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
10. Motor horsepower and NEMA MG 1 code letter designation.
11. Low-voltage cable sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).
12. Medium-voltage cable sizes, lengths, conductor material, and cable construction and metallic shield performance parameters.

3.06 LABELING

A. Apply one arc-flash label for 600-V ac, 480-V ac, and applicable 208-V ac panelboards and disconnects and for each of the following applicable locations:

1. Transfer switches
2. Switchboards
3. Panelboard
4. Variable frequency drives
5. Control panels
6. Disconnects

3.07 APPLICATION OF WARNING LABELS

A. Install the arc-fault warning labels under the direct supervision and control of the Arc-Flash Study Specialist.

END OF SECTION 16055

SECTION 16060

GROUNDING AND BONDING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. For definitions of grounding and bonding terms see NFPA 70.

1.02 SUMMARY

A. Section includes grounding and bonding systems and equipment.

1. Underground distribution grounding.

2. Ground bonding common with lightning protection system.

3. Foundation steel electrodes.

1.03 ACTION SUBMITTALS

A. Provide all submittals in accordance with Section 01300.

B. Product Data: For each type of product indicated.

1.04 INFORMATIONAL SUBMITTALS

A. Provide all submittals in accordance with Section 01300.

B. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:

1. Test wells.

2. Ground rods.

3. Ground rings.

4. Grounding arrangements and connections for separately derived systems.

C. Field quality-control reports.

1.05 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

1. Include the following:

a. Instructions for periodic testing and inspection of grounding features at test wells ground rings grounding connections for separately derived systems based on NETA MTS.

i. Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.

ii. Include recommended testing intervals.

1.06 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Burndy; Part of Hubbell Electrical Systems.
2. ERICO International Corporation.
3. Harger Lightning and Grounding.
4. ILSCO.
5. O-Z/Gedney; A Brand of the EGS Electrical Group.
6. Robbins Lightning, Inc.
7. Or Engineer approved equal.

2.02 SYSTEM DESCRIPTION

A. Complete grounding system including connections to proposed equipment and structures and interconnection with existing grounding system according to these specifications and the contract drawings.

2.03 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

D. Grounding and Bonding Conductors

1. All raceways and equipment shall be provided with an equipment grounding conductor as shown on the drawings. When the equipment grounding conductor

is not shown on the drawings, provide an equipment grounding conductor per Table 250.122 of the NEC.

2. All service entrance equipment shall be provided with a grounding electrode conductor between the service entrance ground and the grounding electrode system as shown on the drawings. When the grounding electrode conductor is not shown on the drawing, provide a grounding electrode conductor per Table 250.66 of the NEC.
3. Main bonding jumper installed between the service entrance ground and neutral and shall be sized per Table 250.66 of the NEC.
4. System bonding jumper installed between the separately derived system ground and neutral and shall be sized per Table 250.66 of the NEC.

2.04 CONNECTORS

A. Listed and labeled by a Nationally Recognized Testing Laboratory (NRTL) acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.05 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel, sectional type; 3/4 inch by 10 feet (19 mm by 3 m) min.

B. Chemical-Enhanced Grounding Electrodes: Copper tube, straight or L-shaped, charged with nonhazardous electrolytic chemical salts.

1. Termination: Factory-attached No. 4/0 AWG bare conductor at least 48 inches (1200 mm) long.
2. Backfill Material: Electrode manufacturers recommended material.

PART 3 – EXECUTION

3.01 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, No. 4/0 AWG minimum.

1. Bury at least 24 inches (600 mm) below grade.
2. Duct-Bank Grounding Conductor: Bury 12 inches (300 mm) above duct bank when indicated as part of duct-bank installation.

C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

D. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.

2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

E. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.

2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.

3. Connections to Ground Rods at Test Wells: Bolted connectors.

4. Connections to Structural Steel: Welded connectors.

3.02 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches (100 mm) will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches (50 mm) above to 6 inches (150 mm) below concrete. Seal floor opening with waterproof, non-shrink grout.

C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors' level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

D. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches (150 mm) from the foundation.

3.03 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

D. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

E. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

F. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.04 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.

2. When service grounding is not detailed on the drawings, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

D. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes shall be at least 12 inches (300 mm) deep, with cover.

1. Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

F. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

G. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.

H. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each steel column, extending around the perimeter of area.

1. Install copper conductor not less than No. 2/0 AWG or as shown on the drawing for ground ring and for taps to building steel.
2. Bury ground ring not less than 24 inches (600 mm) from building's foundation.

I. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; using electrically conductive coated steel reinforcing bars or rods, at least 20 feet (6.0 m) long. If reinforcing is in multiple pieces, connect by the usual steel tie wires or exothermic welding to create the required length.

3.05 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.

2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.
    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81 and NETA Standards.
4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
5. Prepare test and inspection reports.

B. Grounding system will be considered defective if it does not pass tests and inspections.

C. Report measured ground resistances that exceed the following values:

1. Power and lighting equipment or system with capacity of 1000 kVA and less: 5 ohms.
2. Power and lighting equipment or system with capacity more than 1000 kVA: 3 ohms.
3. Power distribution units or panelboards serving electronic equipment: 3 ohm(s).
4. Substations and pad-mounted equipment: 5 ohms.
5. Manhole grounds: 10 ohms.

D. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.

END OF SECTION 16060

SECTION 16071

HANGERS AND SUPPORTS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

1.03 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.04 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified Florida registered professional ENGINEER, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operation weight of supported equipment and connected systems and components.

D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for the Project, with a minimum structural safety factor of five times the applied force.

1.05 ACTION SUBMITTALS

A. Product Data: For the following:

1. Steel slotted support systems.
2. Nonmetallic slotted support systems.

B. Shop Drawings: Signed and sealed by a qualified professional ENGINEER in the state of Florida. Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers: Include product data for components.
2. Steel slotted channel systems: Include product data for components.
3. Nonmetallic slotted channel systems: Include product data for components.
4. Equipment supports.

1.06 INFORMATIONAL SUBMITTALS

A. Welding Certificates

1.07 QUALITY ASSURANCE

A. WELDING: Qualify procedures and personnel according to AWA D1.1/D1.1M, "Structural Welding Code- Steel."

B. Comply with NFPA 70.

1.08 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolts inserts into bases. Concrete, reinforcement, and framework requirements are specified together with concrete Specifications.

B. Coordinate installation of roof mounted electrical with structural and architectural specification and drawings.

PART 2 – PRODUCTS

2.01 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following: a. Allied Tube & Conduit

a. Cooper B-Line, Inc.
b. ERICO International Corporation.
c. GS Metals Corp.
d. Thomas & Betts Corporation.
e. Unistrut; Atkore International.
f. Wesanco, Inc.
g. Or ENGINEER approved Equal.

2. Metallic Coatings: Hot dip galvanized after fabrication and applied according to MFMA-4.

3. Painted Coatings: Manufacturers standard painted coating applied according to MFMA-4.

4. Channel Dimensions: Selected for applicable load criteria.

B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch—(14-mm-) diameter holes at a maximum of 8 inches (200 mm) on center, in at least 1 surface.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following: a. Allied Tube & Conduit.

a. Cooper B-Line, INC.

b. Fabco Plastics Wholesale Limited.
c. Seasafe, Inc.
d. Or approved equal.

2. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
3. Fitting and Accessory Materials: Same as channels and angles, except metal items maybe stainless steel.
4. Rated Strength: Selected to suit applicable load criteria.

C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

D. Conduit and Cable Support Devices shall be as indicated below:

1. PVC Conduit – PVC, Fiberglass, or Stainless Steel (unless atmosphere is corrosive to Stainless Steel)
2. RGS Conduit – Galvanized Steel
3. Aluminum Conduit – Stainless Steel
4. PVC Coated RGS – Stainless Steel (unless atmosphere is corrosive to Stainless Steel); if atmosphere is corrosive to stainless steel, then use fiberglass.
5. EMT – Painted or Galvanized Steel

E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

F. Structured Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.

G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened Portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
    a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
        i. Hilti, Inc.
        ii. ITW Ramset/Red Head; Illinois Tool Works, Inc.
        iii. MKT Fastening, LLC.
        iv. Simpson Strong-Tie Co., Inc.
        v. Or ENGINEER approved Equal.

2. Mechanical-Expansion Anchors: Insert-wedge type, stainless steel, for use in hardened Portland cement concrete with tensions, shear, and pullout capacities appropriate for supported loads and building materials in which used.
    a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
        i. Cooper B-Line, Inc.
        ii. Empire Tool and Manufacturing Co., Inc.
        iii. Hilti, Inc.
        iv. ITW Ramset/Red Head; Illinois Tool Works, Inc.
        v. MKT Fastening, LLC.
        vi. Or ENGINEER approved Equal.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units like MMS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.02 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel, shop or field fabricated to fit dimensions of supported equipment.

PART 3 – EXECUTION

3.01 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and system except if requirements in this Section are more stringent.

B. Maximum, Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as scheduled in NECA 1, where its Table 1 lists maximum spacing less than stated in NFPA 70. Minimum rod size shall be ¼ inch (6mm) in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
    1. Secure raceways and cables to these supports with single-bolt conduit clamps.

3.02 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200lb (90kg).

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100mm) thick.
6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
7. To Light Steel: Sheet metal screws.
8. Items Mounted Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panel boards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.03 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Cut, fit, and replace miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Field Welding: Comply with AWS D1.1/D1.1M.

3.04 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches (100mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi (20.7-MPa) 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements as specified in the contract documents.

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instruction, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.05 PAINTING

A. Touch-up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05mm).

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 16071

SECTION 16075

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Identification for raceway and metal-clad cable.
2. Identification for conductors of power, communication, and control cable.
3. Underground-line warning tape.
4. Warning labels and signs.
5. Instruction signs.
6. Equipment identification labels.
7. Miscellaneous identification products.

1.03 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

C. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

1.04 QUALITY ASSURANCE

A. Comply with ANSI A13.1, ANSI C2, and ANSI Z635.4.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.145

1.05 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, shop drawings, manufacturer's wiring diagrams, Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

E. Install all signs and labels horizontal (level) and consistent for similar equipment and panels.

PART 2 – PRODUCTS

2.01 RACEWAY AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

D. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches wide; compounded for outdoor use.

2.02 CONDUCTORS, COMMUNICATION, AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Aluminum Wraparound Marker Labels: Cut from 0.014-inch- thick aluminum sheet, with stamped, embossed, or scribed legend, and fitted with tabs and matching slots for permanently securing around wire or cable jacket or around groups of conductors.

B. Self-laminating vinyl labels with printed 3/16-inch identification protected by translucent lamination adhered to cables or conductors with permanent acrylic tape. Resistance to chemical or other solvents, water, dirt, and oils. UL approved and RoHS compliant.

2.03 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.

1. Minimum width: 3/16 inch.
2. Tensile Strength: 50lb, minimum.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black, except where used for color-coding.

B. Paint: Paint materials and application requirements are specified in Division 9 painting Sections.

PART 3 – EXECUTION

3.01 APPLICATION

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A: Identify with snap-around label.

1. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

B. Accessible Raceways and Cables of Auxiliary Systems: Identify the following systems with color-coded, snap-around, color-coding bands:

1. Snap-Around Labels: Slit, pre-tensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
2. Fire Alarm System: Red.
3. Fire-Suppression Supervisory and Control System: Red and yellow.
4. Combined Fire Alarm and Security System: Red and blue.
5. Security System: Blue and yellow.
6. Mechanical and Electrical Supervisory System: Green and blue.
7. Telecommunication System: Green and yellow.
8. Control Wiring: Green and red.

C. Power, Control, Instrumentation, and Branch Circuit Identification: Where cables or conductors terminate on terminal blocks or equipment, use wrap around vinyl sleeves with pre-printed labels.

1. Cables and conductors shall be identified with a tag on each end indicating its opposite end termination location.
2. Line 1 shall indicate the cable or circuit number found in the conduit and cable schedule or panelboard circuit for contractor supplied and field routed cables and conductors not found in the conduit and cable schedule. For example: “P-PP-6001” for circuits in the schedule or “LP-0100-24” for panelboard circuits.
3. Line 2 shall indicate the opposite end location termination point with equipment designation, terminal block designation, and terminal number. For example: “CP-1600, TB1-24”.

D. Power-Circuit Conductor Identification: For primary and secondary conductors No. 1/0 AWG and larger in vaults, pull and junction boxes, manholes, and hand holes use metal tags. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.

1. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking nylon tie fastener.

E. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use color-coding conductor tape. Identify each ungrounded conductor according to source and circuit number.

1. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

F. Conductor Color Code Identification: Where the premises wiring system has branch circuits supplied from more than one nominal voltage system, each ungrounded

conductor of a given branch circuit shall be identified by color coded tape or cable insulation at all termination, connection, or splice points.

G. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source and circuit number.

1. Write-On Tags: Polyester tag, 0.015-inch thick, with corrosion-resistant grommet and polyester or nylon tie for attachment to conductor or cable.
2. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

H. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.
4. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

I. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable. Install underground-line warning tape for both direct-buried cables and cables in raceway. During backfilling of trenches install continuous underground-line warning tape directly above line at 12 inches above duct. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

1. Description:
    a. Permanent, bright-colored, continuous-printed, polyethylene tape.
    b. Not less than 6 inches wide by 4 mils thick.
    c. Compounded for permanent direct-burial service.
    d. Embedded continuous metallic strip or core.
    e. Printed legend shall indicate type of underground line.

J. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.

1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:
    a. Power transfer switches.
    b. Controls with external control power connections. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.
2. Comply with NFPA 70 and 29 CFR 1910.145.

3. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.
4. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 7 by 10 inches.
5. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 10 by 14 inches.
    a. Warning label and sign shall include, but are not limited to, the following legends:
    b. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
    c. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

K. Instruction Signs:

1. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with ENGINEER/OWNER APPROVED instructions where needed for system or equipment operation. Instructions are needed for all equipment unless otherwise noted.
    a. Signs shall be engraved, laminated acrylic or melamine plastic, minimum 1/16-inch thick for signs up to 20 sq. in. and 1/8-inch thick for larger sizes.
    b. The engraved legend shall be ½ -inch white letters on brown face and punched or drilled for mechanical fasteners.
    c. The signs shall be installed with stainless hardware.
2. Emergency Operating Instructions: Install emergency operating instruction signs at equipment used for power transfer, safety shutdown, or any other locations requiring operation in an emergency.
    a. Signs shall be engraved, laminated acrylic or melamine plastic, minimum 1/16-inch thick for signs up to 20 sq. in. and 1/8-inch thick for larger sizes.
    b. The engraved legend shall be ½ -inch white letters on red face and punched or drilled for mechanical fasteners.
    c. The signs shall be installed with stainless hardware.

L. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

a. Indoor and Outdoor Equipment: Use engraved, laminated acrylic or melamine labels, punched or drilled for screw mounting. Identification labels shall have black letters on a white background. Unless otherwise indicated, provide a single line of text with 1/2-inch high letters on 1 1/2-inch high label; where 2 lines of text are required, use labels 2-inches high. Mount labels with stainless hardware. (Labels for field mounted equipment shall include the name of the equipment, and the location from which power is feed. See example below:

i. Main Plant Control Panel

(a) Fed from LP-1

2. Elevated Components: Increase the size of the labels and letters to those appropriate for viewing from the floor.

a. Equipment to Be Labeled:
b. Identification labeling of some items listed below may be required by individual Sections or by NFPA 70.
c. Panelboards, electrical cabinets, and enclosures.
d. Transformers.
e. Disconnect switches.
f. Motor starters.
g. Push-button stations.
h. Voice and data cable terminal equipment.
i. Monitoring and control equipment.
j. Uninterruptible power supply equipment.
k. Terminals, racks, and patch panels for voice and data communication and for signal and control functions.
l. Control systems.
m. Field mounted control devices.
n. Field mounted instruments.

3.02 INSTALLATION PRACTICES

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Attach non-adhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

D. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service, feeder, and branch-circuit conductors.

1. Color shall be factory applied or, for sizes LARGER than No. 10 AWG if authorities having jurisdiction permit, field applied.

2. Colors for 208/120-V Circuits:

a. Phase A: Black.
b. Phase B: Red.
c. Phase C: Blue.

3. Colors for 480/277-V Circuits:

    a. Phase A: Brown.
    b. Phase B: Orange.
    c. Phase C: Yellow.

4. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

5. Where the premises wiring system has branch circuits supplied from more than one nominal voltage system, the color codes used to identify each phase, neutral (if applicable) and ground conductor throughout the system shall be permanently posted at each branch-circuit panelboard or similar branch-circuit distribution equipment. Provide factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.

E. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

F. Painted Identification: Prepare surface and apply paint according to Section 09900.

END OF SECTION 16075

SECTION 16120

LOW VOLTAGE ELECTRICAL POWER CONDUCTORS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.03 ACTION SUBMITTALS

A. Submit the following in accordance with Section 01300:

1. Product data: for each type of product

1.04 INFORMATIONAL SUBMITTALS

A. Submit the following in accordance with Section 01300:

1. Qualification data: for testing agency
2. Field quality-control reports
3. Standard test record sheets

PART 2 – PRODUCTS

2.01 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements provide products by use of the following:

1. Alpha Wire.
2. Belden Inc.
3. Encore Wire Corporation.
4. General Cable Technologies Corporation.
5. Southwire Incorporated.

B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658. Unless specifically shown on the plans as aluminum.

C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-2-THWN-2, Type XHHW-2, RHW-2 Low Smoke, SOW and Type SO.

D. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for metal-clad cable, Type MC, Type SO with ground wire.

2.02 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Gardner Bender.
3. Hubbell Power Systems, Inc.
4. Ideal Industries, Inc.
5. IIsco; a branch of Bardes Corporation.
6. NSi Industries LLC.
7. O-Z/Gedney; a brand of the EGS Electrical Group.
8. 3M; Electrical; Markets Division.
9. Tyco Electronics.

B. Description: Factory-fabricated connectors and splices of size, capacity rating, material, type, and class for application and service indicated.

2.03 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 3 – EXECUTION

3.01 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 18 AWG and smaller; stranded for No. 16 AWG and larger.

B. General Branch Circuits in building for lighting and receptacles: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.

3.02 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. All water and wastewater facilities:

1. Feeders concealed in concrete, below slabs-on-grade, and underground: Type XHHW-2, single conductors in raceway.
2. Branch Circuits concealed in ceilings, walls, and partitions of an air-conditioned space: Type THHN-THWN, single conductors in raceway metal-clad cable, Type MC.
3. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and underground: Type XHHW-2, single conductors in raceway.

4. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire mesh, strain relief device at terminations to suit application.
5. Class 1 Control Circuits: Type XHHW-2, in raceway.
6. Class 2 Control Circuits: Type XHHW-2, in raceway.

3.03 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Division 16 prior to pulling conductors and cables.

C. Use manufacturers-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufactures recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means; including fish tape, cable, rope, and blanket-weave wire/cable grips that will not damage cables or raceway.

E. Support cables according to Section 16071 “Hangers and Supports for Electrical Systems.”

3.04 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer’s published torque tightening values. If manufacturer’s torque values are not indicated, use those specified in UL 486A-486B. All torque tightening equipment shall be calibrated before use with calibration records available for inspection.

B. Make splices, terminations and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.

C. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

3.05 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 16075 “Identification for Electrical Systems.”

B. Identify each spare conductor at each end with identity number and location of other end of conductor and identify as spare conductor.

3.06 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 16131, “Sleeves and Sleeve Seals for Electrical Raceways and Cabling.”

3.07 FIRESTOPPING

A. Apply fire stopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to the project specifications.

3.08 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Record all results and submit to engineer for approval. Certify compliance with manufacturer's test parameters, in the absence of Manufacturer's published data; certify compliance with the table listed in NETA Acceptance Testing Specification.
2. All testing must be carried out by competent persons, currently listed as NETA certified.
3. NETA Acceptance Testing Specification is the minimum level of testing that will be required on all projects with the most relevant inspection and test procedures extracted as listed below. The following list includes additional tests that will be required unless stated otherwise.
    a. Pre-connection
        i. Visual mechanical inspection.
        ii. Perform resistance measurements through bolted connections with a low resistance DC Ohm meter or an insulation resistance test meter.
        iii. Continuity of all protective conductors to be recorded using a low resistance DC Ohmmeter or an insulation resistance test meter.
        iv. Check continuity of all conductors and verify correct cable connections.
        v. Check polarity of all conductors.
        vi. Perform insulation resistance test on each conductor with respect to ground and all adjacent conductors using an insulation resistance test meter. Each conductor must be tested for 1 minute.
        vii. Verify uniform resistance of all parallel conductors.
    b. Post-connection
        i. Test and record the impedance at the supply origin.
        ii. Test and record the ground fault loop impedance between all live conductors and ground at the furthest extents of each final circuit. This test is to be completed using a fault loop Impedance tester and all results must be in compliance with the Circuit Protective Device (CPD) limits from the Manufacturer.
        iii. Test and record the operating trip time of all GFI and GFCI's devices to ensure compliance with NEC and Manufacturer's published data. This test is to be completed using a GFCI test meter.

iv. Other functional testing may be listed here if required.

4. Infrared Scanning: After substantial completion, but not more than 60 days after final acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.

B. Test and Inspection Reports: Prepare a written report to record the following:

1. Procedures used.
2. List of test personal with resumes.
3. Summit all test results on the enclosed test forms, see form to follow.
4. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

C. Cables will be considered defective if they do not pass tests and inspections.

(FORM TO FOLLOW)

END OF SECTION 16120

TEST RECORD SHEET

SHEET NUMBER

CLIENT NAME: INSTALLATION ADDRESS:

CATEGORY (Industrial, Commercial, Residential, Other) TYPE OF INSTALLATION: NEW REHAB EXISTING TEMP. OTHER

RESTRICTIONS (EQUIPMENT VULNERABLE TO TESTING):

Circuit Label	Circuit Designation	Cable			No. of Points	Overcurrent		Continuity of Ground Conductors (Ω)	All Lives to Ground (MΩ)	Ø(A) to All Lives (MΩ)	Ø(B) to All Lives (MΩ)	Ø(C) to All Lives (MΩ)	N To All Phases (MΩ)	Polarity	L-Gnd Ground Fault Loop Impedance (Ohms)	Functional Testing		Comments
		Type	Size	Gnd. Size		Type	Rating (Amps)									GFCI Trip Time (ms)	Other	

Deviations from Code or Specifications:

DISTRIBUTION BOARD	
LOCATION:	
DISTRIBUTION BOARD REFERENCE:	
MAIN PROTECTIVE DEVICE: TYPE	
SUPPLY CABLE TO DB: TYPE:	
RATING (A):	
SIZE:	

ELECTRICITY SUPPLY	
VOLTAGE:	
FREQUENCY:	
NO. OF PHASES:	
PFC (kA):	
IMP. AT ORIGIN (Ω):	

TESTERS/INSTRUMENTS TYPE	BRAND	MODEL	CALIBRATION DATE
INSULATION			
CONTINITY			
LOOP IMPEDANCE			
GFCI TESTER			
OTHER			

PRE-COMMISSIONING TESTING COMPLETED BY (BLOCK LETTERS) SIGNATURE: DATE OF TESTING:

POST-COMMISSIONING TESTING COMPLETED BY (BLOCK LETTERS) SIGNATURE: DATE OF TESTING:

PN: 502101130-015

SECTION 16130

RACEAYS AND BOXES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Handholes and boxes for exterior underground cabling.

1.03 DEFINITIONS

A. ARC: Aluminum rigid conduit.

B. GRC: Galvanized rigid steel conduit.

C. IMC: Intermediate metal conduit.

D. EMT: Electrical Metallic Tubing.

E. PVC: Polyvinyl Chloride Conduit Schedule 40, Schedule 80.

F. LFMC: Liquidtight Flexible Metallic Conduit.

1.04 ACTION SUBMITTALS

A. Provide all submittals in accordance with Section 01300.

B. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

C. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.05 INFORMATIONAL SUBMITTALS

A. Provide all submittals in accordance with Section 01300.

B. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of conduit groups with common supports.

2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

C. Seismic Qualification Certificates: For enclosures, cabinets, and conduit racks and their mounting provisions, include those for internal components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.

D. Source quality-control reports.

PART 2 – PRODUCTS

2.01 METAL CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Allied Tube & Conduit.
3. Anamet Electrical, Inc.
4. Electri-Flex Company.
5. O-Z/Gedney.
6. Picoma Industries.
7. Republic Conduit.
8. Robroy Industries.
9. Southwire Company.
10. Thomas & Betts Corporation.
11. Western Tube and Conduit Corporation.
12. Wheatland Tube Company.
13. or Approved Equal.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. ARC: Comply with ANSI C80.5 and UL 6A.

E. IMC: Comply with ANSI C80.6 and UL 1242.

F. PVC-Coated Rigid Conduit

1. Comply with NEMA RN 1.

2. Coating Thickness: 0.040 inch (1 mm), minimum.

G. EMT: Comply with ANSI C80.3 and UL 797.

H. FMC: Comply with UL 1; zinc-coated steel or aluminum.

I. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

J. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.

2. Fittings for EMT:

a. Material: Steel.
b. Type: compression.

3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.

K. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.02 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.

2. Anamet Electrical, Inc.

3. Arnco Corporation.

4. CANTEX Inc.

5. CertainTeed Corporation.

6. Condux International, Inc.

7. Electri-Flex Company.

8. Kraloy.

9. Electrical Products.

10. Niedax-Kleinhuis USA, Inc.

11. RACO; Hubbell.

12. Thomas & Betts Corporation.

13. or Approved Equal.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. See Evaluations for descriptions of nonmetallic conduit types.

D. ENT: Comply with NEMA TC 13 and UL 1653.

E. RNC: Type EPC-40-PVC, or EPC-80-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

F. LFNC: Comply with UL 1660.

G. Rigid HDPE: Comply with UL 651A.

H. Continuous HDPE: Comply with UL 651B.

I. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D 3485.

J. RTRC: Comply with UL 1684A and NEMA TC 14.

K. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

L. Fittings for LFNC: Comply with UL 514B.

2.03 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper B-Line, Inc.

2. Hoffman.

3. Mono-Systems, Inc.

4. Square D.

5. or Approved Equal.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 for interior or Type 4X stainless steel for exterior unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged type for NEMA 1 and hinged, flanged-and-gasketed type for NEMA 4X unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.04 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Allied Moulded Products, Inc.
2. Hoffman.
3. Carlon Electrical Products.
4. Niedax-Kleinhuis USA, Inc.
5. or Approved Equal.

B. Listing and Labeling: Nonmetallic wireways and auxiliary gutters shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Description: Fiberglass polyester or PVC, extruded and fabricated to required size and shape, and having hinged cover with captive screws.

D. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.

2.05 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Adalet.
2. Cooper Technologies Company; Cooper Crouse-Hinds.
3. EGS/Appleton Electric.
4. Erickson Electrical Equipment Company.
5. FSR Inc.
6. Hoffman.
7. Hubbell Incorporated.
8. Kraloy.
9. Milbank Manufacturing Co.
10. Mono-Systems, Inc.
11. O-Z/Gedney.
12. RACO; Hubbell.
13. Robroy Industries.
14. Spring City Electrical Manufacturing Company.
15. Stahlin Non-Metallic Enclosures.

16. Thomas & Betts Corporation.

17. Wiremold / Legrand.

18. or Approved Equal.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy or aluminum to match raceway type, Type FD, with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover, unless otherwise noted.

I. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep), unless otherwise noted.

J. Gangable boxes are prohibited, unless specifically noted.

K. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 4X Stainless Steel for outdoor locations, Type 12 for indoor locations, with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

2. Nonmetallic Enclosures: Fiberglass.

3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

L. Cabinets:

1. NEMA 250, Type 4X Stainless Steel for outdoor locations, Type 12 for indoor locations, with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.

2. Hinged door in front cover with flush latch and concealed hinge.

3. Key latch to match panelboards.

4. Metal barriers to separate wiring of different systems and voltage.

5. Accessory feet where required for freestanding equipment.

6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.06 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    a. Armorcast Products Company.
    b. Carson Industries LLC.
    c. NewBasis.
    d. Oldcastle Precast, Inc.
    e. Quazite: Hubbell Power System, Inc.
    f. Synertech Moulded Products.
    g. Or approved equal.
2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, as required to identify system indicated on the drawings.
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
8. Handholes 24-inches wide by 24-inches long by 24-inches deep and larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

C. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers of fiberglass unless otherwise noted.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    a. Armorcast Products Company.
    b. Carson Industries LLC.
    c. NewBasis.
    d. Nordic Fiberglass, Inc.
    e. Oldcastle Precast, Inc; Christy Concrete Products.
    f. Quazite: Hubbell Power System, Inc; Hubbell Power Systems.
    g. Synertech Moulded Products.
    h. Or Approved Equal.

2. Standard: Comply with SCTE 77.
3. Color of Frame and Cover: Gray.
4. First option in "Configuration" Subparagraph below facilitates bottom conduit entry. Second option may be provided by a separate slab placed in the excavation under an open-bottom enclosure; third option is obtained by molding or fabricating the bottom integrally with the body of unit.
5. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
6. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
7. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
8. Cover Legend: Molded lettering, as required to identify system indicated on the drawings.
9. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
10. Handholes 24-inches long by 24-inches deep and larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.07 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
   1. Tests of materials shall be performed by an independent testing agency.
   2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional ENGINEER in the State of Florida shall certify tests by manufacturer.
   3. Testing machine pressure gauges shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

PART 3 – EXECUTION

3.01 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed Conduit: PVC Coated aluminum rigid conduit (ARC)
   2. Concealed Conduit, Aboveground: RNC, Type EPC-40-PVC, unless otherwise indicated on drawings.
   3. Underground Conduit: RNC, Type EPC-40-PVC when concrete encased, Type EPC-80-PVC when direct buried.
   4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC unless otherwise indicated on drawings.

5. Connection between structures (Including between ground storage tanks and stair platforms): LFMC unless otherwise indicated on drawings. Power level 120VAC and above LFMC between rigid conduit sections or between rigid conduit and equipment shall have an insulated ground jumper installed between insulated ground bushings.
6. Boxes and Enclosures, Aboveground: NEMA 250, Type 4X Stainless steel unless otherwise indicated on drawings.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: ARC.
2. Exposed, Not Subject to Severe Physical Damage: ARC.
3. Exposed and Subject to Severe Physical Damage: ARC. Raceway locations include the following:
   a. Loading dock.
   b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
   c. Mechanical rooms.
   d. Gymnasiums.
4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: ARC unless otherwise noted.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4X stainless steel in institutional and commercial kitchens and damp or wet locations, unless otherwise noted.
8. Corrosive environments (i.e. hypochlorite storage area): Type EPC-80-PVC.

C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20. Insulated grounding bushings where applicable.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

G. Install surface raceways only where indicated on Drawings.

H. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

3.02 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Arrange stub-ups so curved portions of bends are not visible above finished slab.

E. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.

F. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

G. Support conduit within 12 inches (300 mm) of enclosures to which attached.

H. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m) intervals.

2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.

3. Arrange raceways to keep a minimum of 3 inches of concrete cover in all directions.

4. Do not embed thread less fittings in concrete unless specifically approved by ENGINEER for each specific location.

5. Some authorities having jurisdiction may not permit nonmetallic tubing in fire-rated slabs in subparagraph below.

6. Change from ENT to GRC before rising above floor.

I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

J. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

K. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

L. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

M. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

N. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

O. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Clean and cap underground raceways designated as spare above grade alongside raceways in use.

P. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

Q. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

   1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
   2. Where an underground raceway enters a building or structure.
   3. Where otherwise required by NFPA 70.

R. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

S. Expansion-Joint Fittings:

   1. Provide expansion joint fitting any time conduit systems cross building expansion joints or structural expansion joints.
   2. Provide expansion fittings as recommended by the manufacturer of the conduit.
   3. Provide expansion fittings per NFPA 70.
   4. Formula in first subparagraph below provides about 15 percent safety factor (extra expansion-contraction capability).
   5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

T. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
3. Provide a separate ground jumper for all liquid tight flexible power level conduits runs utilizing insulated grounding bushings sized as follows:

a. ¾” to 1” conduit - #12 awg insulated ground.
b. 1 ¼” to 2” conduit - #8 awg insulated ground.
c. 2 ½” to 6” conduit - #4 awg insulated ground.

U. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

V. Provide a flat surface for a raintight connection between boxes and cover plate or supported equipment and box.

W. Horizontally separate boxes mounted on opposite sides of walls, so they are not in the same vertical channel.

X. Locate boxes so that cover or plate will not span different building finishes.

Y. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

Z. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

AA. Set metal floor boxes level and flush with finished floor surface.

BB. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.03 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit.
2. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction per 95 percent modified proctor density.
3. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor. Wrap conduit with 2 coats of 3M Scotch Wrap or Approved Equal.

a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete for a minimum of 12 inches (300 mm) on each side of the coupling.
b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

4. Underground Warning Tape: Comply with requirements in Section 16075 "Identification for Electrical Systems."

3.04 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 16131 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.05 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 16130

SECTION 16131

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including SJCUD General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:

1. For penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items, use UL listed assemblies for the type and installation applied.

1.03 ACTION SUBMITTALS

A. Submit in accordance with Section 01300:

1. Product data for each type of product.

1.04 INFORMATION SUBMITTALS

A. Submittals are in accordance with section 01300.

1.05 O&M SUBMITALS

A. Submit operation and maintenance data in accordance with section 01730.

1.06 QUALITY ASSURANCE

A. Source Limitations: Obtain equipment within same product category, from single source from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NFPA 70.

PART 2 – PRODUCTS

2.01 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40. (For use with grounding electrode conductors only.

D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

F. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.

2. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and with no side larger than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
b. For sleeve cross-section rectangle perimeter 50 inches (1270 mm) or more and one or more sides larger than 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.02 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Advance Products & Systems, Inc.
b. CALPICO, Inc.
c. Metraflex Company (The).
d. Pipeline Seal and Insulator, Inc.
e. Proco Products, Inc.
f. or Approved Equal.

2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

3. Pressure Plates: Stainless steel.

4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.03 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Presealed Systems.
b. or Approved Equal.

2.04 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.05 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 – EXECUTION

3.01 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 07900 "Joint Sealants."
b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

3. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install steel pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.02 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.03 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION

SECTION 16140

WIRING DEVICES

PART 1 – GENERAL

1.01 RELATED

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.03 ACTION SUBMITTALS

A. Submit the following in accordance with Section 01300:

1. Product data: for each type of product

1.04 INFORMATION SUBMITTALS

A. Submit the following in accordance with Section 01300:

1. Qualification data: for testing agency
2. Field quality-control reports
3. Standard test record sheets

PART 2 – PRODUCTS

2.01 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements provide products by use of the following:

1. Alpha Wire.
2. Belden Inc.
3. Encore Wire Corporation.
4. General Cable Technologies Corporation.
5. Southwire Incorporated.

B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658. Unless specifically shown on the plans as aluminum.

C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-2-THWN-2, Type XHHW-2, RHW-2 Low Smoke, SOW and Type SO.

D. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for metal-clad cable, Type MC, Type SO with ground wire.

2.02 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Gardner Bender.
3. Hubbell Power Systems, Inc.
4. Ideal Industries, Inc.
5. IIsco; a branch of Bardes Corporation.
6. NSi Industries LLC.
7. O-Z/Gedney; a brand of the EGS Electrical Group.
8. 3M; Electrical; Markets Division.
9. Tyco Electronics.

B. Description: Factory-fabricated connectors and splices of size, capacity rating, material, type, and class for application and service indicated.

2.03 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 3 – EXECUTION

3.01 CONDUCTOR AND MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 18 AWG and smaller; stranded for No. 16 AWG and larger.

B. General Branch Circuits in building for lighting and receptacles: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.

3.02 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. All water and wastewater facilities:

1. Feeders concealed in concrete, below slabs-on-grade, and underground: Type XHHW-2, single conductors in raceway.
2. Branch Circuits concealed in ceilings, walls, and partitions of an air-conditioned space: Type THHN-THWN, single conductors in raceway metal-clad cable, Type MC.
3. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and underground: Type XHHW-2, single conductors in raceway.

4. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire mesh, strain relief device at terminations to suit application.
5. Class 1 Control Circuits: Type XHHW-2, in raceway.
6. Class 2 Control Circuits: Type XHHW-2, in raceway.

3.03 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Division 16 prior to pulling conductors and cables.

C. Use manufacturers-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufactures recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means; including fish tape, cable, rope, and blanket-weave wire/cable grips that will not damage cables or raceway.

E. Support cables according to Section 16071 “Hangers and Supports for Electrical Systems.”

3.04 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer’s published torque tightening values. If manufacturer’s torque values are not indicated, use those specified in UL 486A-486B. All torque tightening equipment shall be calibrated before use with calibration records available for inspection.

B. Make splices, terminations and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.

C. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

3.05 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 16075 “Identification for Electrical Systems.”

B. Identify each spare conductor at each end with identity number and location of other end of conductor and identify as spare conductor.

3.06 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 16131, “Sleeves and Sleeve Seals for Electrical Raceways and Cabling.”

3.07 FIRESTOPPING

A. Apply fire stopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to the project specifications.

3.08 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Record all results and submit to engineer for approval. Certify compliance with manufacturer's test parameters, in the absence of Manufacturer's published data; certify compliance with the table listed in NETA Acceptance Testing Specification.
2. All testing must be carried out by competent persons, currently listed as NETA certified.
3. NETA Acceptance Testing Specification is the minimum level of testing that will be required on all projects with the most relevant inspection and test procedures extracted as listed below. The following list includes additional tests that will be required unless stated otherwise.
    a. Pre-connection
        i. Visual mechanical inspection.
        ii. Perform resistance measurements through bolted connections with a low resistance DC Ohm meter or an insulation resistance test meter.
        iii. Continuity of all protective conductors to be recorded using a low resistance DC Ohmmeter or an insulation resistance test meter.
        iv. Check continuity of all conductors and verify correct cable connections.
        v. Check polarity of all conductors.
        vi. Perform insulation resistance test on each conductor with respect to ground and all adjacent conductors using an insulation resistance test meter. Each conductor must be tested for 1 minute.
        vii. Verify uniform resistance of all parallel conductors.
    b. Post-connection
        i. Test and record the impedance at the supply origin.
        ii. Test and record the ground fault loop impedance between all live conductors and ground at the furthest extents of each final circuit. This test is to be completed using a fault loop Impedance tester and all results must be in compliance with the Circuit Protective Device (CPD) limits from the Manufacturer.
        iii. Test and record the operating trip time of all GFI and GFCI's devices to ensure compliance with NEC and Manufacturer's published data. This test is to be completed using a GFCI test meter.

iv. Other functional testing may be listed here if required.

4. Infrared Scanning: After substantial completion, but not more than 60 days after final acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.

B. Test and Inspection Reports: Prepare a written report to record the following:

1. Procedures used.
2. List of test personal with resumes.
3. Summit all test results on the enclosed test forms, see form to follow.
4. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

C. Cables will be considered defective if they do not pass tests and inspections.

(FORM TO FOLLOW)

END OF SECTION

TEST RECORD SHEET

SHEET NUMBER

CLIENT NAME: INSTALLATION ADDRESS:

CATEGORY (Industrial, Commercial, Residential, Other) TYPE OF INSTALLATION: NEW REHAB EXISTING TEMP. OTHER

RESTRICTIONS (EQUIPMENT VULNERABLE TO TESTING):

Circuit Label	Circuit Designation	Cable			No. of Points	Overcurrent		Continuity of Ground Conductors (Ω)	All Lives to Ground	Ø(A) to All Lives (MΩ)	Ø(B) to All Lives (MΩ)	Ø(C) to All Lives (MΩ)	N To All Phases (MΩ)	Polarity	L-Gnd Ground Fault Loop Impedance (Ohms)	Functional		Comments
		Type	Size	Gnd. Size		Type	Rating (Amps)									GFCI Trip Time (ms)	Other	

Deviations from Code or Specifications:

DISTRIBUTION BOARD	
LOCATION:	
DISTRIBUTION BOARD REFERENCE:	
MAIN PROTECTIVE DEVICE: TYPE	
SUPPLY CABLE TO DB: TYPE:	
RATING (A):	
SIZE:	

ELECTRICITY SUPPLY	
VOLTAGE:	
FREQUENCY:	
NO. OF PHASES:	
PFC (kA):	
IMP. AT ORIGIN (Ω)	

TESTERS/INSTRUMENTS			
TYPE	BRAND	MODEL	CALIBRATION DATE
INSULATION			
CONTINITY			
LOOP IMPEDANCE			
GFCI TESTER			
OTHER			

PRE-COMMISSIONING TESTING COMPLETED BY (BLOCK LETTERS) SIGNATURE: DATE OF TESTING:

POST-COMMISSIONING TESTING COMPLETED BY (BLOCK LETTERS) SIGNATURE: DATE OF TESTING:

PN: 502101130-015

SECTION 16150

ELECTRIC MOTORS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes general requirements for single-phase and polyphase electric motors for use in the water and wastewater environments.

1.03 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices and features to be compatible with the following:

1. Motor controllers
2. Torque, speed, and horsepower requirements of the load
3. Ratings and characteristics of supply circuit and required control sequence.

1.04 SUBMITTALS

A. Submit shop drawings in accordance with Section 01300.

1.05 REFERENCES

A. ANSI/AFBMA 9-1990, Load Ratings and Fatigue Life for Ball Bearings.

B. ASTM B117-90, Test Method of Salt Spray (Fog) Testing.

C. IEEE Standard 85-1973, IEEE Standard Test Procedure for Airborne Sound Measurements on Rotating Electric Machinery.

D. IEEE Standard 112-1991, IEEE Standard Test Procedure for Polyphase Induction Motor and Generators.

E. IEEE Standard 841-1994, IEEE Standard for Petroleum and Chemical Industry - Severe Duty.

F. NEMA MG 13 -1984, Frame Assignments for Alternating Current Integral Horsepower Induction Motors.

G. NEMA MG 1-2016, Motors and Generators.

1.06 PROJECT CONDITIONS

A. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.

B. Altitude: Not exceeding 6600 feet.

1.07 SPARE PARTS

A. Furnish spare parts that match components installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Manufacturer standard recommended spare parts and consumables.

1.08 WARRANTY

A. All equipment supplied under this section shall be warranted for a period of five (5) years by the MANUFACTURER. Warranty period shall commence as outlined in Section 01740 and City of Apalachicola General Conditions.

B. The equipment shall be warranted to be free from defects in workmanship, design and materials. If any part of the equipment should fail during the warranty period, it shall be replaced in the machine(s) and the unit(s) restored to service at no expense to the OWNER.

C. The MANUFACTURER'S warranty period shall run concurrently with the CONTRACTOR'S warranty period. No exception to this provision shall be allowed.

D. The CONTRACTOR shall be fully responsible for proper storage of motors prior to placing in service in accordance with the manufacturers' recommendations and instructions. Any problem with motors at startup due to mishandling or by not adhering to the manufacturers' recommendations for storage will be the sole responsibility of the contractor. All costs to repair the motors due to any mishandling or improper storage will be at no cost to the owner, the supplier, or the manufacturer of the motor, but shall be entirely the responsibility of the CONTRACTOR.

PART 2 – PRODUCTS

2.01 GENERAL MOTOR REQUIREMENTS

A. Comply with requirements in this Section except when stricter requirements are specified in equipment schedules or Sections.

B. Comply with NEMA MG 1 unless otherwise indicated.

C. Comply with IEEE 841 for severe-duty motors.

2.02 DESIGN STANDARDS

A. Indoor motors shall be 3 phase induction machines rated continuous duty at 60 HZ, single voltage with across-the-line full voltage start, unless otherwise noted.

B. Production AC motors are available in 56 through 5811 frames at speeds of 3600, 1800, 1200, and 900RPM.

C. Stock AC motors are available in 56T through 447T frames 1-200HP at speeds of 3600, 1800 and 1200RPM, 480 Volt designs.

D. Motors comply with the frame size assignments of NEMA MG 13-1984.

1. Any motors that require special modifications, such as "TZ" shafts or special "D" flanges shall be noted clearly in the submittals with spare recommendations from the manufacturer.

2. All motors that are not standard NEMA 1964 re-rate "T" frame motors shall be factory painted blue with pink conduit boxes attached to be clearly identified to the owner. At installation, the Contractor shall paint the motors to the owner's choice of color.

E. NO IEC MOTORS WILL BE ALLOWED.

F. Motor manufacturer shall be an active member of NEMA.

G. Motor manufacturer shall have experience in the design and manufacture of similar products for a minimum of 10 years. Buy-out or private labeled motors are not acceptable.

H. All fractional to 2 HP direct current (DC) motors shall be either permanent magnet or shunt wound design with a constant torque speed range or 20:1.

I. Acceptable motor manufacturers will be US Motors, General Electric, Reliance, or ENGINEER approved equal.

2.03 ENCLOSURES

A. All indoor general purpose horizontal motors shall be ODP and meet specification NEMA MG-1, unless otherwise noted.

B. All outdoor general purpose horizontal motors shall be TEFC and meet specification IEEE 841, unless otherwise noted.

C. All motors in hazardous locations shall be Division One explosion proof, as defined by UL, meeting the Class and Group as required by the hazard.

2.04 SERVICE CONDITIONS

A. Motors are suitable for continuous duty operation without de-rating under the project conditions.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor. Motors may be constant or variable torque as required to meet the conditions of the load being serviced.

C. Suitable for use in indoor or outdoor applications involving severe duty conditions such as high humidity or chemical laden, corrosive, or salty atmospheres as applicable.

D. Motors are capable of successfully accelerating inertia loads equal to what is specified in section 12.54 of NEMA MG 1 2016. Variable Frequency Drive (VFD) or Full voltage, across-the-line starting.

2.05 ELECTRICAL DESIGNS

A. Motors shall be NEMA Design B as defined in section 1.17.1.2 of NEMA MG 1-2016, unless specifically noted requiring different motor curves.

B. Motors shall operate successfully at rated load under the combinations of voltage and frequency variations specified in section 12.44 of NEMA MG 1-2016.

C. Motors shall operate successfully under running conditions at rated load and frequency when voltage unbalance at the motor terminals does not exceed 1%.

D. Motors shall be premium efficient designs that exceed the efficiency values in Table 1 of IEEE Standard 841-1994. Efficiency testing is done in accordance with IEEE

standard 112-1991, sub-clause 6.4 Method B. The nominal efficiency, ¾ load efficiency and guaranteed minimum efficiency, are stamped on the motor's nameplate.

E. Motors shall utilize a non-hygroscopic, chemical and humidity resistant insulation system. The thermal rating of the system is Class F as defined in section 1.66 on NEMA MG1-2016.

F. The stator windings for 1-200HP and under 600 volts are random or form wound with copper wire utilizing inverter grade insulation system that meets and exceeds NEMA MG1-2016 Part 31.

G. Stator is double dipped and baked in varnish to form a heavy build that exceeds the test criteria of moisture resistance per NEMA MG-1.

H. When operated at rated horsepower, voltage and frequency, the temperature rise of the stator winding does not exceed 80C when measured by winding resistance.

I. Motors shall utilize the inverter grade insulation system which consists of at a minimum Class F or better insulation materials with additional phase insulating material, extra end-turn bracing and Class H spike resistant wire. The resultant system shall withstand 2000-volt transients without premature motor failure and have no cable limitations in motor application.

J. All motors connected to a VFD, shall include ceramic bearings or grounding isolation rings.

K. Motors shall operate successfully under inverter running conditions at rated load with variation in the voltage or the frequency not exceeding the following conditions:

1. +/-10% rated voltage at rated constant volts/hertz ratio except for specific torque boost situations.

2. Motors shall operate successfully under running conditions at rated load and volts/hertz ratio when the voltage unbalance at the motor terminals does not exceed one percent.

L. Inverter Operating Characteristics - With rated volts/hertz ratio applied, motor performance shall be as follows for critical operating characteristics:

1. Torque – Motors shall meet or exceed the minimum locked rotor (starting) and breakdown torque specified in NEMA Standard MG 1, Part 12 for Design B for the rating specified when on sine wave power.

2. Currents – Maximum overload current shall be 150% of nameplate for 60 seconds or 175% for 3 seconds.

M. Motors shall be rated for a 1.15 service factor on sine wave power and 1.0 service factor on VFD power.

2.06 MECHANICAL DESIGN

A. Motors are equipped with ball bearings have AFBMA C/3 clearances and shall be the same size on both ends (with exception of 440T frame - minimum 6318 on Drive end bearing).

B. Bearings are re-greaseable without disassembling the fan or fan cover and provide for the elimination of purged grease through fittings extending beyond the fan cover. Polyurea thickened grease shall be supplied.

C. Inner bearing caps are provided for bearing retention and to prevent harmful amounts of lubricant from entering the motor interior.

D. For direct coupled motors, stabilized bearing temperature shall not exceed a temperature rise of 45 degrees C for 4 and 6 pole motors and a maximum temperature rise of 50 degrees C for 2 pole motors as measured by a thermocouple on the surface of the bearing house.

E. Bearings provide for an L-10 life of 100,000 hours per ANSI/AFBMA 9-1990 based on NEMA belting application limits per NEMA MG1-2016, section 14.41.

F. Enclosures have a degree of protection rated for the installation location (per NEMA MG-1 2016 and IEEE 841). Bearing isolators are provided on all 143 to 5811 'T' frame motors to minimize entrance of moisture and contaminants into the bearing chamber. Motors shall be capable of field retrofit of an opposite drive end shield bearing isolator.

G. Condensation drain holes are provided at the low points in the end brackets and are supplied with corrosion resistant, breather drain plugs.

H. Frame, brackets, fan cover and conduit box are a minimum of grade 25 cast iron.

I. Rotor cage construction shall be of cast aluminum. The maximum permissible shaft runout at the end of the shaft extension of the assembled motor shall be:

   1. 0.875" to 1.625" diameter inclusive TIR < 0.001 6.10.2 Over 1.626" to 6.50" diameter, TIR,0.0015 (ball bearing) and 0.002 (roller bearing).

J. Motor mounting feet, when placed on a flat granite surface, shall not exceed 0.005" between the granite surface and the motor feet at each mounting bolt hole.

K. A drilled and tapped hole is provided in the motor frame on the same side as the conduit box for grounding purposes.

L. Ventilating fans, where applicable, are of non-sparking conductive plastic material. Most ratings use bi-directional fans. On ratings where uni-directional fans are used, the rotation of the fan is indicated by a permanent label on the outside of the motor.

M. Conduit box is diagonally split, rotatable in 90-degree increments, and twice the volume as specified in Section 11.06.2 of NEMA MG1-2016. A ground lug is provided in the box. Gaskets are provided between the conduit box and frame and between conduit box base and cover providing a moisture resistant barrier.

N. Shouldered eyebolts with a minimum safety factor of 10 are provided for motor lifting.

O. All fastening hardware is hex-head bolts or socket head cap screws with a grade 5, zinc/cadmium plating.

P. Motor cast iron components are oxide primed and painted with vinyl phenolic paint to surpass 250-hour salt spray test per ASTM B117-90.

Q. Motor nameplate is stainless steel and secured with 4 stainless steel drive pins. Nameplates are capable of meeting 720-hour salt spray test per ASTM B117-90. Each

nameplate incorporates National Electrical Code requirements, requirements of section 10.40 of NEMA MG1-2016 and the following:

1. AFBMA bearing ID.
2. Manufacture date code.
3. Compliance with IEEE Standard 841-1994, where applicable.
4. Enclosure rating.
5. Motor weight.
6. Guaranteed minimum efficiency.
7. Maximum space heater surface C temperature, if provided, when operating at rated voltage in a 40C ambient.
8. Balance.
9. NEMA MG1 Part 31.
10. “Inverter Duty Rated” – where applicable.

R. Machined frame to end shield joints are protected by an application of 2-part epoxy before assembly.

2.07 AIRBORNE SOUND

A. Motor sound power level when measured at a no-load condition shall not exceed 90 dBA when determined in accordance with IEEE Standard 85-1973.

2.08 VIBRATION

A. Motor vibration measured in any direction on the bearing housing meets the levels listed below when tested per section 12.08 of NEMA MG1-2016:

1. Unfiltered vibration at rated voltage and frequency does not exceed 0.08 in/s peak velocity for 2, 4 and 6 pole motors and .06 in/s peak velocity for 8 pole motors.
2. Filtered vibration does not exceed 0.05 in/s peak velocity at a frequency of 2f (twice line frequency).
3. Unfiltered axial vibration does not exceed 0.06 in/s peak velocity on bearing housing (does not apply to roller bearings).

2.09 ACCESSORIES

A. Winding thermostats shall be in each phase of the motor. There shall be one per phase, NC, connected in series with leads terminating in the auxiliary outlet box.

B. For vertical hollow shaft motors, a ball-type non-reversing ratchet shall be provided to prevent back-spin of the pump and motor. Maximum reverse rotation shall be limited to 5 degrees or arc.

C. Stabilizing bushings shall be provided on all vertical hollow shaft motors applied to pumps with mechanical seals. All 3600 RPM hollow shaft motors shall be provided with stabilizing bushings.

D. Motors 20 HP and above shall be started on soft starts or variable frequency drives, unless noted otherwise.

E. Each motor over 20 HP shall be equipped with a suitably sized space heater to prevent condensation from forming while the motor is not running. The space heater shall be 120V, single phase with leads terminating in the auxiliary outlet box.

F. All motors shall be provided with suitable coupling for connection to mechanical loads.

2.10 SINGLE-PHASE MOTORS

A. Motors larger than 1/2 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Capacitor starts, inductor runs.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Pre-lubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/2 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range. Provide a separate termination box for the thermal protection connections. This box may be shared with a motor heater, if required.

F. Provide a separate termination box for the thermal protection connections. This box may be shared with a motor heater, if required.

PART 3 – EXECUTION

3.01 PRODUCTION TESTS

A. The following tests are to be performed on all motors, and submitted with shop drawings:

1. Measurement of winding resistance
2. No load readings of current, power, and speed at rated voltage and frequency
3. Mechanical vibration checks as described in NEMA MG1-2016 part 7, using either elastic or rigid mount
4. High potential test in accordance with section 12.03 of NEMA MG1-2016
5. All tests shall be certified tests from the factory.

B. The following test information is recorded and inserted in the motors' conduit box.

1. Winding Resistance
2. No load current, voltage and speed

3. The following five unfiltered vibration readings, measured as described in NEMA MG1-2016 part 7: drive end (horizontal, vertical, and axial) and opposite drive end (horizontal and vertical)

C. The Manufacturer shall submit certification that all motors comply with NEMA Premium Efficiency Standards.

3.02 FIELD STARTUP TESTS

A. The following tests are to be performed on all motors prior to startup and commissioning under the direction of a manufacturer authorized service representative:

1. Measurement of winding resistance
2. No load readings of current, power, and speed at rated voltage and frequency
3. Mechanical vibration checks as described in NEMA MG1-2016 part 7, using either elastic or rigid mount
4. High potential test in accordance with section 12.03 of NEMA MG1-2016
5. Rotational checks
6. Power conductor insulation resistance test prior to making motor terminations.

B. The CONTRACTOR shall submit certification that all motors have been tested in accordance with these specifications and are ready for startup and commissioning.

C. Submit formal report to ENGINEER including documentation of all field test results for review and approval prior to startup and commissioning.

3.03 DEMONSTRATION

A. CONTRACTOR shall engage a factory-authorized service representative to train OWNER's maintenance personnel to adjust, operate, and maintain all motors furnished and installed as shown in the contract documents.

END OF SECTION 16150

SECTION 16231

PACKAGED ENGINE GENERATOR-INSTALLATION

PART 1 - GENERAL

This specification is for the CONTRACTOR installation of OWNER furnished equipment. PART 2- PRODUCTS is **REFERENCE ONLY.**

1.01 SYSTEM DESCRIPTION

A. Provide a standby backup system for the Water Treatment Plant, in the event of failure of the normal supply, consisting of all equipment for a complete operating system, in the event of a power failure.

B. Provide fully automatic operation so that unit takes full load within 10 seconds after power failure.

C. Ratings:

1. kW: Equipment specific standby, capable of full load pickup in a single step for site. Provide computer generated sizing calculations to confirm performance as detailed herein.
2. Power Factor: 80 percent.
3. Output connections: 3-phase, 4-wire
4. Maximum RPM: 1,800.
5. Altitude: 500 feet above mean sea level.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.03 SUMMARY

A. This Section includes packaged engine-generator sets for standby power supply with the following features:

1. Diesel engine.
2. Unit-mounted cooling system.
3. Unit-mounted control and monitoring.
4. Performance requirements for sensitive loads.
5. Outdoor enclosure.

B. Related Sections include the following:

1. Division 16 – “16415 - Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine-generator sets.

1.04 DEFINITIONS

A. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

1.05 SUBMITTALS

A. Product Data: For each type of packaged engine generator indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. In addition, include the following:

1. Thermal damage curve for generator.
2. Time-current characteristic curves for generator protective device.
3. Alternator and Automatic voltage regulator manual
4. Engine and Speed control manual

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Dimensioned outline plan and elevation drawings of engine-generator set and other components specified.
2. Design Calculations: Signed and sealed by a qualified professional engineer. Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
3. Vibration Isolation Base Details: Signed and sealed by a qualified professional engineer. Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include base weights.
4. Wiring Diagrams: Power, signal, and control wiring.

C. Source quality-control test reports.

1. Certified summary of prototype-unit test report.
2. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.
3. Certified Summary of Performance Tests: Certify compliance with specified requirement to meet performance criteria for sensitive loads.
4. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.
5. Report of sound generation.
6. Report of exhaust emissions showing compliance with applicable regulations.
7. Certified Torsional Vibration Compatibility: Comply with NFPA 110.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals. In addition to the project requirements for operation and maintenance data, include the following:

1. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.

F. Warranty: Special warranty specified in this Section.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1. Maintenance Proximity: Not more than four hours' normal travel time from Installer's place of business to Project site.

B. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 200 miles of Project site, a service center capable of providing training, parts, and emergency maintenance repairs. In addition, the service center shall stock 80% of the parts required for the generator.

C. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Comply with ASME B15.1.

F. Comply with NFPA 37.

G. Comply with NFPA 70.

H. Comply with NFPA 99.

I. Comply with NFPA 110 requirements for Level 2 emergency power supply system.

J. Comply with UL 2200.

K. Engine Exhaust Emissions: Comply with all applicable requirements including federal, state and local government requirements.

L. Fuel Systems and Storage: Comply with all applicable requirements including federal, state and local government and environmental requirements.

M. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by generator set including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.

1.07 PROJECT CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then

only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Engineer and Owner no fewer than two days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Engineer’s and Owner's written permission.

B. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

1. Ambient Temperature: 5 to 40 deg C.
2. Relative Humidity: 0 to 95 percent.
3. Altitude: Sea level to 1000 feet.

1.08 COORDINATION

A. Coordinate size and location of concrete bases for package engine generators. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

1.09 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.

1. Generator Warranty Period: 5 years from date of Substantial Completion.
2. Fuel Tank Warranty Period: 3 years from date of Substantial Completion.

1.10 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of manufacturer's designated service organization. Include quarterly exercising to check for proper starting, load transfer, and running under load. Include routine preventive maintenance as recommended by manufacturers and adjusting as required for proper operation. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

1.11 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: One for every 10 of each type and rating, but no fewer than one of each.
2. Indicator Lamps: Two for every six of each type used, but no fewer than two of each.
3. Filters: One set each of lubricating oil, fuel, and combustion-air filters.

PART 2 – PRODUCTS (REFERENCE ONLY)

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Caterpillar
2. Engineer and Owner pre-approved equal.

2.02 ENGINE-GENERATOR SET

A. Factory-assembled and -tested, engine-generator set.

B. Mounting Frame: Maintain alignment of mounted components without depending on concrete foundation; and have lifting attachments.

1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and generator-set center of gravity.

C. Characteristics:

1. Output Connections: Three-phase, four wire.
2. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component.

D. Generator-Set Performance for Sensitive Loads:

1. Oversizing generator compared with the rated power output of the engine is permissible to meet specified performance.
2. Steady-State Voltage Operational Bandwidth: 1 percent of rated output voltage from no load to full load.
3. Transient Voltage Performance: Not more than 10 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within 0.5 second.
4. Steady-State Frequency Operational Bandwidth: Plus or minus 0.25 percent of rated frequency from no load to full load.
5. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
6. Transient Frequency Performance: Less than 2-Hz variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within three seconds.
7. Output Waveform: At no load, harmonic content measured line to neutral shall not exceed 2 percent total with no slot ripple. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
8. Sustained Short-Circuit Current: For a 3-phase, bolted short circuit at system output terminals, system shall supply a minimum of 300 percent of rated full-load

current for not less than 10 seconds and then clear the fault automatically, without damage to winding insulation or other generator system components.

9. Excitation System: Performance shall be unaffected by voltage distortion caused by nonlinear load.
    a. Provide permanent magnet excitation for power source to voltage regulator with 3X field forcing for 10 seconds minimum.
10. Start Time: Comply with NFPA 110, Type 10, system requirements.

2.03 ENGINE

A. Fuel: Diesel ASTM D975 No. 2-D.

B. Rated Engine Speed: 1800 rpm.

C. Maximum Piston Speed for Four-Cycle Engines: 2250 fpm.

D. Lubrication System: The following items are mounted on engine or skid:
    1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
    2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and designed to be fail-safe.
    3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

E. Engine Fuel System:
    1. Main Fuel Pump: Mounted on engine. Pump ensures adequate primary fuel flow under starting and load conditions.
    2. Relief-Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.

F. Coolant Jacket Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity.

G. Governor: Electronic as Required for Generator Paralleling

H. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine-generator-set mounting frame and integral engine-driven coolant pump.
    1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
    2. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
    3. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.

4. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
5. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.
    a. Rating: 50-psig maximum working pressure with coolant at 180 deg F, and non collapsible under vacuum.
    b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

I. Muffler/Silencer: Critical type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.
    1. Minimum sound attenuation of 25 dB at 500 Hz.
    2. Sound level measured at a distance of 15 feet from exhaust discharge after installation is complete shall be 85 dBA or less.

J. Air-Intake Filter: Standard-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.

K. Starting System: 24-V electric, with negative ground.
    1. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in Part 1 "Project Conditions" Article.
    2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
    3. Cranking Cycle: As required by NFPA 110 for system level specified.
    4. Battery: Adequate capacity within ambient temperature range specified in Part 1 "Project Conditions" Article to provide specified cranking cycle at least three times without recharging.
    5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
    6. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.

2.04 DIESEL STORAGE

A. Comply with NFPA 30 and local, state and federal environmental regulations.

B. Sub-base Mounted Fuel Oil Tank: Factory installed and piped, complying with UL 142 fuel oil tank. Features include the following:
    1. Containment Provisions: Comply with requirements of authorities having jurisdiction. Comply with NFPA 30.

2. The storage tank shall be a secondarily contained rectangular steel tank capable of mounting an engine generator to top of tank. The tank shall be “Special Purpose” UL142 listed and labeled.
3. The tank shall be designed, tested and labeled per UL requirements to support the proposed generator, and lift lugs shall be approved by UL with a 4 to 1 safety factor.
4. Features include the following:
    a. Tank level indicator: Solar powered tank monitoring system providing local high-level alarm, low level alarm, and leak detection.
        i. Acceptable manufacturer: Greenleaf Solar Gauge Model EFG-8000-I, or pre-approved equal.
    b. Capacity: Fuel for 72 hours' continuous operation at 100 percent rated power output.
    c. Vandal-resistant fill cap.
    d. Containment Provisions: Double Wall Steel.
    e. Fuel tank shall be acceptable to the state environmental protection agency and provided with an electronic leak protection system and an audio/visual alarm indication.
    f. Fuel Tank Coating System
        i. Exterior Painting Schedule
            (a) Organic Zinc-rich/Urethane/Urethane Coating System
            (b) Surface Preparation: SSPC-SP6; commercial blasting cleaning
            (c) Prime Coat: Series 90-97 Tnemec-Zinc at 2.5 to 3.5 mils Dry Film Thickness (DFT)
            (d) Intermediate Coat: Series 1075 Endura-Shield-Color at 2.0 to 3.0 mils DFT
            (e) Finish Coat: Series 1075 Endura-Shield Color at 2.0 to 3.0 mils DFT
            (f) Minimum Total DFT: 7.0mils
    g. Access Stairs: Provide aluminum access stairs with hand rails for each generator enclosure access door or panel when the top of the fuel tank exceeds 18-inches above the equipment pad.
    h. Fuel tank to be mounted on 8” high I-Beams to allow for maintenance of bottom fuel tank.
    i. The primary and secondary tanks shall be fabricated from minimum ¼” steel.
    j. Primary tank shall be air pressure tested at three (3) PSI using a leak detection solution and the secondary tank shall be air pressure tested at one and one-half (1-1/2) PSI using a leak detection solution.
    k. There shall be an annular space between the primary and secondary tank to provide an immediate leak path for external monitoring manually or electronically.
    l. The tank shall include earthquake/hurricane restraint tie downs and drillings for grounding attachments.
    m. All tank-top fittings shall be forged steel weld flanges.

n. All tank applications (installations) shall be reviewed by the proper fire district regulating authority and properly permitted. All tanks shall be labeled by product, capacity and manufacturer.
o. Updraft and emergency venting shall be provided by tank manufacturer per UL 142 requirements.
p. Provide 4-20mA signal proportional to fuel tank level for control system.
q. Provide mechanical reading fuel level gauge, low fuel level alarm contact, and fuel tank rupture alarm contact.

2.05 CONTROL AND MONITORING

A. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of generator set. When mode-selector switch is switched to the on position, generator set starts. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of a remote emergency-stop switch also shuts down generator set.

B. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the generator set. Mounting method shall isolate the control panel from generator-set vibration.

C. Indicating and Protective Devices and Controls: As required by NFPA 110 for Level 2 system, and the following:

1. AC voltmeter.
2. AC ammeter.
3. AC frequency meter.
4. DC voltmeter (alternator battery charging).
5. Engine-coolant temperature gage.
6. Engine lubricating-oil pressure gage.
7. Running-time meter.
8. Ammeter-voltmeter, phase-selector switch(es).
9. Generator-voltage adjusting rheostat.
10. Low fuel level.
11. Tank leak detected.
12. Low battery voltage.
13. Battery charger failure.

D. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.

E. Remote Emergency-Stop Switch: Flush; wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

2.06 GENERATOR OVERCURRETN AND FAULT PROTECTION

A. Generator Circuit Breaker: Molded case, electronic-trip type; 100 percent rated; complying with UL 489.

1. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous.

2. Trip Settings: Selected to coordinate with generator thermal damage curve.

3. Shunt Trip: Connected to trip breaker when generator set is shut down by other protective devices.

4. Mounting: Adjacent to or integrated with control and monitoring panel.

B. Ground-Fault Indication: Comply with NFPA 70, "Emergency System" signals for ground-fault. Integrate ground-fault alarm indication with other generator-set alarm indications.

2.07 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Comply with NEMA MG 1.

B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

C. Electrical Insulation: Class H or Class F.

D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required.

E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.

F. Enclosure: Drip proof.

G. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified.

1. Adjusting rheostat on control and monitoring panel shall provide plus or minus 5 percent adjustment of output-voltage operating band.

H. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.

I. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.

J. Sub transient Reactance: 12 percent, maximum.

2.08 OUTDOOR GENERATOR SET ENCLOSURE

A. Description: Vandal-resistant, weatherproof Aluminum housing, wind resistant up to 150-180 mph. Multiple panels shall be lockable and provide adequate access to

components requiring maintenance. Panels shall be removable by one person without tools. Instruments and control shall be mounted within enclosure.

B. Description: Prefabricated or pre-engineered Non-walk-in enclosure with the following features:

1. Construction: Galvanized-steel, metal-clad, integral structural-steel-framed building erected on concrete foundation.
2. Structural Design and Anchorage: Comply with ASCE 7 for wind loads.
3. Space Heater: Thermostatically controlled and sized to prevent condensation.
4. Louvers: Equipped with bird screen and filter arranged to permit air circulation when engine is not running while excluding exterior dust, birds, and rodents.
5. Hinged Doors: With padlocking provisions.
6. Ventilation: Louvers equipped with bird screen and filter arranged to permit air circulation while excluding exterior dust, birds, and rodents.
7. Thermal Insulation: Manufacturer's standard materials and thickness selected in coordination with space heater to maintain winter interior temperature within operating limits required by engine-generator-set components.
8. Muffler Location: External to enclosure.

C. Engine Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for 2 hours with ambient temperature at top of range specified in system service conditions.

1. Louvers: Fixed-engine, cooling-air inlet and discharge. Storm-proof and drainable louvers prevent entry of rain and snow.
2. Fixed Dampers: At engine cooling-air inlet and discharge. Dampers shall be fixed when unit is not operating.

D. Interior Lights with Switch: Factory-wired, vapor-proof fixtures within housing; arranged to illuminate controls and accessible interior. Arrange for external electrical connection.

1. AC lighting system and connection point for operation when remote source is available.
2. DC lighting system for operation when remote source and generator are both unavailable.

E. Convenience Outlets: Factory wired, GFCI. Arrange for external electrical connection.

F. Provide a 60A(minimum),120/240V, 1-phase, 3-wire circuit breaker panelboard, NEMA 3R enclosure installed inside the enclosure with branch circuit breakers for battery charger, block heater, lighting and all other accessories.

2.09 VIBRATION ISOLATION DEVICES

A. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic restraint.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to wind loads or if weight is removed; factory-drilled baseplate bonded to 1/4-inch-thick, elastomeric isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
2. Outside Spring Diameter: Not less than 80 percent of compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.10 FINISHES

A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

2.11 SOURCE QUALITY CONTROL

A. Prototype Testing: Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.
   1. Tests: Comply with NFPA 110, Level 1 Energy Converters and with IEEE 115.

B. Project-Specific Equipment Tests Before shipment, factory test engine-generator set, and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:
   1. Test components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.
   2. Full load run.
   3. Maximum power.
   4. Voltage regulation.
   5. Transient and steady-state governing.
   6. Single-step load pickup.
   7. Safety shutdown.

PART 3 – EXECUTION

3.01 EXAMINATION BY OWNER AND CONTRACTOR

A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine-generator performance.

B. Examine roughing-in of piping systems and electrical connections. Verify actual locations of connections before packaged engine-generator installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Comply with packaged engine-generator manufacturers' written installation and alignment instructions and with NFPA 110.

B. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.

C. Install packaged engine generator with restrained spring isolators having a minimum deflection of 1 inch on 4-inch- high concrete base. Secure sets to anchor bolts installed in concrete bases.

D. Install Schedule 40, black steel piping with welded joints and connect to engine muffler. Install thimble at wall. Piping shall be same diameter as muffler outlet.

1. Install condensate drain piping to muffler drain outlet full size of drain connection with a shutoff valve, stainless-steel flexible connector, and Schedule 40, black steel pipe with welded joints.

E. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

3.03 CONNECTIONS

A. Connect fuel, cooling-system, and exhaust-system piping adjacent to packaged engine generator to allow service and maintenance.

B. Connect engine exhaust pipe to engine with flexible connector.

C. Connect fuel piping to engines.

D. Ground equipment according to Division 16 Section " 16060 - Grounding and Bonding."

E. Connect wiring according to Division 16 Section " 16120 - Low Voltage Electrical Power Conductors."

3.04 IDENTIFICATION

A. Identify system components according to Division 16 Section " 16075 - Identification for Electrical Systems”

3.05 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

B. Tests and Inspections:

1. Perform tests recommended by manufacturer and each electrical test and visual and mechanical inspection for "AC Generators and for Emergency Systems" specified in NETA Acceptance Testing Specification. Certify compliance with test parameters.

2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here including, but not limited to, single-step full-load pickup test.
3. Include fuel required for all testing. After successful completion and acceptance of all tests, provide fuel and fill the tank of each installed generator to 50% of capacity.
4. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.
    a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
    b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
    c. Verify acceptance of charge for each element of the battery after discharge.
    d. Verify that measurements are within manufacturer's specifications.
5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine-generator system before and during system operation. Check for air, exhaust, and fluid leaks.
6. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases, and verify that performance is as specified.
7. Harmonic-Content Tests: Measure harmonic content of output voltage under 25 percent and at 100 percent of rated linear load. Verify that harmonic content is within specified limits.

C. Coordinate tests with tests for transfer switches and run them concurrently.

D. Test instruments shall have been calibrated within the last 12 months, traceable to standards of NIST, and adequate for making positive observation of test results. Make calibration records available for examination on request.

E. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

F. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

G. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

H. Remove and replace malfunctioning units and retest as specified above.

I. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

J. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

K. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each power wiring termination and each bus connection. Remove all access panels so terminations and connections are accessible to portable scanner.

1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan 11 months after date of Substantial Completion.
2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
3. Record of Infrared Scanning: Prepare a certified report that identifies terminations and connections checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.06 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators.

END OF SECTION

SECTION 16289

LOW VOLTAGE SURGE PROTECTION

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes field-mounted SPDs for low-voltage (120 to 600 V) power distribution and control equipment.

B. Related Requirements:

1. Section "16443-Motor Control Centers" for factory installed SPDs.

1.03 DEFINITIONS

A. In: Nominal discharge current.

B. MCOV: Maximum continuous operating voltage.

C. Mode(s), also Modes of Protection: The pair of electrical connections where the VPR applies.

D. MOV: Metal-oxide varistor; an electronic component with a significant non-ohmic current-voltage characteristic.

E. OCPD: Overcurrent protective device.

F. SCCR: Short-circuit current rating.

G. SPD: Surge protective device.

H. VPR: Voltage protection rating.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

2. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, I nominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.

1.05 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Sample Warranty: For manufacturer's special warranty.

1.06 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to replace or replace SPDs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

1.07 MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following:

1. Surge Suppression, Inc.

2. Phoenix Contact

PART 2 – PRODUCTS

2.01 GENERAL SPD REQUIREMENTS

A. SPD with Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. All Surge Protective Devices (SPDs) shall be tested and listed to the latest edition of ANSI/UL 1449-2006. “Manufactured in accordance with UL 1449” is not equivalent to being listed to ANSI/UL 1449-2006 and does not meet the intention of this specification.

D. MCOV of the SPD shall be the nominal system voltage.

E. SPD units shall be UL 1283 Listed as an Electromagnetic Interference Filter and marked accordingly.

F. Provide SPDs with the following modes of protection:

1. Three-Phase, Four Wire systems: 10 Modes: L1-L2, L2-L3, L3-L1, L1-N, L2-N, L3-N, L1-G, L2-G, L3-G, N-G

2. Three-Phase, Three Wire systems: 6 Modes: L1-L2, L2-L3, L3-L1, L1-G, L2-G, L3-G

3. Single-Phase, Three Wire Systems: 6 Modes: L1-L2, L2-N, N-L1, L1-G, L2-G, N-G

2.02 SERVICE ENTRANCE AND TRANSFER SWITCH SUPPRESSOR

A. SPDs: Listed under UL 1449, Type 1.

1. SPDs with the following features and accessories:

a. Integral disconnect switch and overcurrent protection.
b. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
c. Indicator light display for protection status.
d. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status.

e. Digital Display Surge counter that counts the number of surges the device has experienced since installation.
f. Audible alarm

B. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 240kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

C. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V, 208Y/120 V or 240/120 V, three-phase, four-wire circuits shall not exceed the following:

1. Line to Neutral: 1200 V for 480Y/277 V; 700 V for 208Y/120 & 240/120 V.
2. Line to Ground: 1200 V for 480Y/277 V; 1200 V for 208Y/120 & 240/120 V.
3. Line to Line: 2000 V for 480Y/277 V 1000 V for 208Y/120 & 240/120 V.

D. Protection modes and UL 1449 VPR for 240/120 V, single-phase, three-wire circuits shall not exceed the following:

1. Line to Neutral: 700 V.
2. Line to Ground: 1000
3. Line to Line: 1000 V.

E. SCCR: Equal or exceed 200 kAIC.

F. Nominal Discharge Current (In) Rating: 20 kA.

2.03 SWITCHBOARD, PANELBOARD AND MCC SUPPRESSORS

A. SPDs: Comply with UL 1449, Type 2.

1. Include LED indicator lights for power and protection status.
2. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
3. Include Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status

B. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 100 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

C. Protection modes and UL 1449 VPR for grounded wye circuits with, three-phase, four-wire circuits shall not exceed the following:

1. Line to Neutral: 1200 V for 480Y/277 V or 700 V for 208Y/120 V & 240/120 V.
2. Line to Ground: 1200 V for 480Y/277 V or 700 V for 208Y/120 V & 240/120 V.
3. Neutral to Ground: 1200 V for 480Y/277 V or 700 V for 208Y/120 V & 240/120 V.
4. Line to Line: 2000 V for 480Y/277 V or 1200 V for 208Y/120 V & 240/120 V.

D. Protection modes and UL 1449 VPR for 240/120-V, single-phase, three-wire circuits shall not exceed the following:

1. Line to Neutral: 600V.
2. Line to Ground: 600V.
3. Neutral to Ground: 600V.
4. Line to Line: 1000V.

E. SCCR: Equal or exceed 100K AIC min or per the one-line diagram

F. Nominal Discharge Current (In) Rating: 20 kA

G. Sinewave Tracking/Frequency Responsive Capability.

1. SPDs installed to protect Switchboards, Panelboards or MCCs serving sensitive electronic equipment shall utilize voltage independent, frequency responsive dedicated Sinewave Tracking circuitry to mitigate the effects of switching or ringing surges.
    a. Sensitive Electronic Equipment shall include, but is not limited to:
        i. Variable Frequency Controllers
        ii. Lighting with Electronic Ballasts
2. EMI/RFI filtering specifically will not be considered as equal to sinewave tracking.
3. Devices with Sinewave Tracking circuitry shall be tested in accordance with the latest edition of IEEE C62.41.2 for a Category A Ring Wave (2000 volt – 67-amp ring wave)
    a. The maximum amplitude shall be less than 50V peak deviation from the insertion point of the surge on the sine wave to the peak of the transient.

2.04 ENCLOSURES

A. Indoor Enclosures: NEMA 250, Type 1.

B. Outdoor Enclosures: NEMA 250, Type 4X.

2.05 CONDUCTORS AND CABLES

A. Power Wiring: Same size as SPD leads, complying with Section "16120 - Low Voltage Electrical Power Conductors."

PART 3 – EXECUTION

3.01 INSTALLATION

A. Comply with NECA 1.

B. Install an OCPD or disconnect as required to comply with the UL listing of the SPD. DO NOT WIRE DIRECT TO PANEL BUS

C. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible and adjust circuit-breaker positions to achieve shortest and straightest leads. Do not splice and extend SPD leads unless specifically permitted by manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

D. Use crimped connectors and splices only. Wire nuts are unacceptable.

E. Wiring:

1. Power Wiring: Comply with wiring methods in Section "16120 - Low Voltage Electrical Power Conductors "
2. Controls: Comply with wiring methods in Section "16120 - Low Voltage Electrical Power Conductors ."

3.02 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative.

1. Compare equipment nameplate data for compliance with Drawings and Specifications.
2. Inspect anchorage, alignment, grounding, and clearances.
3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.

B. An SPD will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.03 STARTUP SERVICE

A. Complete startup checks according to manufacturer's written instructions.

B. Do not perform insulation-resistance tests of the distribution wiring equipment with SPDs installed. Disconnect SPDs before conducting insulation-resistance tests and reconnect them immediately after the testing is over.

C. Energize SPDs after power system has been energized, stabilized, and tested.

END OF SECTION 16289

SECTION 16410

ENCLOSED SWITCHES AND CIRCUIT BREAKERS-INSTALLATION

PART 1 – GENERAL

This specification is for the CONTRACTOR installation of OWNER furnished equipment. PART 2- PRODUCTS is **REFERENCE ONLY**.

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes:

1. Molded Case Circuit Breakers (MCCBs)-MCB-1
2. Fusible Switches
3. Non-fusible switches
4. Enclosures.

1.03 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels. Coordinate with other disciplines to ensure installation does not impact constructability and meets installation requirements of the contract documents and manufacturer's recommendations.

1.04 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Include evidence of NRTL listing for series rating of installed devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

B. Shop Drawings in accordance with specification 01300 and as follows:

1. Plans, elevations, sections, details

2. Wiring Diagrams: For power, signal, and control wiring.

C. Field quality-control reports.

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
2. Altitude: Not exceeding 3,300 feet.

1.07 SPARE PARTS

A. Furnish spare parts that match components installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Control Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
3. Indicating Lights: Two of each type and color installed.
4. Relays: Two of each type and style installed.
5. Terminal Blocks: 10 percent spare terminal blocks installed within the equipment. These are installed and not shipped loose.

1.08 WARRANTY

A. Manufacturer's Warranty:

1. Warranty Period: One year from date of Substantial Completion. Manufacturer agrees to repair or replace equipment that fail in materials or workmanship within specified warranty period.

PART 2 – PRODUCTS (REFERENCE ONLY)

2.01 FUSIBLE SWITCHES - NOT INCLUDED

2.02 NON-FUSIBLE SWITCHES - NOT INCLUDED

2.03 MOLDED-CASE CIRCUIT BREAKERS-MCB-1

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ABB
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. Square D; a brand of Schneider Electric

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents. Breakers shall be suitable for service entrance and shall be 100% rated.

C. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:

1. Instantaneous trip.
2. Long- and short-time pickup levels.
3. Long- and short-time time adjustments.
4. Ground-fault pickup level, time delay, and I^2t response.

D. Features and Accessories (provide only when shown on the drawings as required):

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
5. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
6. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.

7. Alarm Switch: One normally open contact that operates only when circuit breaker has tripped.
8. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
9. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
10. Electrical Operator: Provide remote control for on, off, and reset operations.

2.04 SERVICE ENTRANCE

A. SPDs: Listed under UL 1449, Type 1.

1. SPDs with the following features and accessories:

a. Integral disconnect switch and overcurrent protection.
b. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
c. Indicator light display for protection status.
d. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status.
e. Digital Display Surge counter that counts the number of surges the device has experienced since installation.
f. Audible alarm

B. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 240kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

C. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V, 208Y/120 V or 240/120 V, three-phase, four-wire circuits shall not exceed the following:

1. Line to Neutral: 1200 V for 480Y/277 V; 700 V for 208Y/120 & 240/120 V.
2. Line to Ground: 1200 V for 480Y/277 V; 1200 V for 208Y/120 & 240/120 V.
3. Line to Line: 2000 V for 480Y/277 V 1000 V for 208Y/120 & 240/120 V.

D. Protection modes and UL 1449 VPR for 240/120 V, single-phase, three-wire circuits shall not exceed the following:

1. Line to Neutral: 700 V.
2. Line to Ground: 1000
3. Line to Line: 1000 V.

E. SCCR: Equal or exceed 200 kAIC.

F. Nominal Discharge Current (In) Rating: 20 kA

2.05 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Conditioned Dry and Clean Locations: NEMA Type 1.
2. Line side shall be bottom entry.
3. Load side shall be top entry.

PART 3 – EXECUTION

3.01 EXAMINATION BY OWNER AND CONTRACTOR

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

C. Install fuses in fusible devices.

D. Comply with NECA 1.

3.03 IDENTIFICATION

A. Comply with requirements in specification 16075 “Identification for Electrical Systems.”

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.
3. Service entrance equipment shall be labelled by the manufacturer or installation contractor with nominal system voltage, available fault current, OCPD clearing time, and date label was applied. Where arc flash labels are also applied, the required information can be distributed between the labels.

3.04 FIELD QUALITY CONTROL

A. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

C. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.05 ADJUSTING

A. Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges based on results of specification 16055 “Overcurrent Protective Devices Arc - Flash Study".

END OF SECTION

SECTION 16415

TRANSFER SWITCHES-INSTALLATION

PART 1 – GENERAL

This specification is for the CONTRACTOR installation of OWNER furnished equipment. PART 2- PRODUCTS is **REFERENCE ONLY**.

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes transfer switches rated 600 V and less, including the following:

1. Automatic transfer switches.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings in accordance with specification “Submittals” including dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.

C. Qualification Data: For manufacturer.

D. Field quality-control test reports.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Maintain a service center capable of providing training, parts, and emergency maintenance repairs within a response period of less than eight hours from time of notification. An authorized ATS technician employed by the ATS manufacturer shall perform startup service and basic operational training for the owner or an owner’s representative following ATS installation.

B. Source Limitations: Obtain automatic transfer switches and remote annunciator and control panels through one source from a single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with NEMA ICS 1.

E. Comply with NFPA 70.

F. Comply with NFPA 99.

G. Comply with NFPA 110.

H. Comply with UL 1008 unless requirements of these Specifications are stricter.

1.05 PROJECT CONDITIONS

A. Equipment shall be rated for the project site environmental conditions.

1.06 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

1.07 WARRANTY

A. Manufacturer's Warranty:

1. Warranty Period: Five years from date of Substantial Completion. Manufacturer agrees to repair or replace transfer switches that fail in materials or workmanship within specified warranty period.

PART 2 – PRODUCTS (REFERENCE ONLY)

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Automatic Transfer Switches:
   a. ASCO 7000
   b. Or Engineer/Owner Approved Equal.

2.02 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

A. Switch and enclosure arrangements shall be as indicated in the project documents and shall be front accessible only capable of being placed against a wall. Provide side wireways and top hat wireways as required to facilitate circuit installation and terminations.

B. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.

C. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.

1. Where transfer switch includes internal fault-current protection, rating of switch and trip unit combination shall exceed indicated fault-current value at installation location.

D. Solid-State Controls: Repetitive accuracy of all settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.

E. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

F. Electrical Operation: Accomplish by a non-fused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.

G. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

1. Switch Action: Double throw; mechanically held in both directions.

2. Contacts: Silver composition or silver alloy for load-current switching.

a. Conventional automatic transfer-switch units, rated 225 A and higher, shall have separate arcing contacts.

H. Heater: Equip switches exposed to outdoor temperatures and humidity, and other units indicated, with an internal heater. Provide thermostat within enclosure to control heater. Finger safe fuse pullers shall be provided for fuses feeding heater circuits.

I. Annunciation, Control, and Programming Interface Components: Devices at transfer switches for communicating with remote programming devices, annunciators, or annunciator and control panels shall have communication capability matched with remote device.

J. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, either by color-code or by numbered or lettered wire and cable tape markers at terminations. Color-coding and wire and cable tape markers are specified in Section 16075 "Identification for Electrical Systems."

1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.

2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.

3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.

2.03 AUTOMATIC TRANSFER SWITCHES

A. Enclosure:

1. Indoor: NEMA 12

2. Outdoor: NEMA 4X, 316 SS with 3-Point Door Handle Operated Latch

B. Comply with Level 1 equipment according to NFPA 110.

C. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.

D. Switch Configuration: Custom configuration shall include normal terminal lugs and load terminal lugs located at the top of the enclosure. Emergency terminal lugs shall be at the bottom of the enclosure.

E. Manual Switch Operation: Unloaded. Control circuit automatically disconnects from electrical operator during manual operation.

F. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval is adjustable from 1 to 30 seconds.

G. Digital communication interface matches the capability of remote annunciator or annunciator and control panel. Communications with the Plant PLC/SCADA system located in SSP-1 shall be provided as indicated on the Contract Drawings.

H. Transfer Switches Based on Molded-Case-Switch Components: Comply with NEMA AB 1, UL 489, and UL 869A.

I. Automatic Transfer-Switch Features:

1. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
2. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.
3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
4. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 10 minutes to automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
5. Test Switch: Simulate normal-source failure.
6. Switch-Position Pilot Lights: Indicate source to which load is connected.
7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.
    a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
    b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."
8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 120 VAC.
9. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 24 VDC minimum.
11. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.

12. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 60 minutes. Factory settings are for 7-day exercise cycle, 30-minute running period, and 5 minute cool down period. Exerciser features include the following:
    a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
    b. Push-button programming control with digital display of settings.
    c. Integral battery operation of time switch when normal control power is not available.

2.04 TRANSFER SWITCH SUPPRESSOR

A. SPDs: Listed under UL 1449, Type 1.

1. SPDs with the following features and accessories:

    a. Integral disconnect switch and overcurrent protection.
    b. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
    c. Indicator light display for protection status.
    d. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status.
    e. Digital Display Surge counter that counts the number of surges the device has experienced since installation.
    f. Audible alarm

B. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 240kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

C. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V, 208Y/120 V or 240/120 V, three-phase, four-wire circuits shall not exceed the following:

1. Line to Neutral: 1200 V for 480Y/277 V; 700 V for 208Y/120 & 240/120 V.

2. Line to Ground: 1200 V for 480Y/277 V; 1200 V for 208Y/120 & 240/120 V.

3. Line to Line: 2000 V for 480Y/277 V 1000 V for 208Y/120 & 240/120 V.

D. Protection modes and UL 1449 VPR for 240/120 V, single-phase, three-wire circuits shall not exceed the following:

1. Line to Neutral: 700 V.

2. Line to Ground: 1000

3. Line to Line: 1000 V.

E. SCCR: Equal or exceed 200 kAIC.

F. Nominal Discharge Current (In) Rating: 20 kA.

2.05 SOURCE QUALITY CONTROL

A. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Identify components according to specification 16075 “Identification for Electrical Systems.”

B. Coordinate and set field-adjustable intervals and delays, relays, and engine exerciser clock in accordance with OWNER requirements.

3.02 CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

B. Ground equipment according to specification 16060 “Grounding and Bonding.”

C. Connect wiring according to specification 16120 "Low Voltage Electrical Power Conductors” and specification 16710 “Communications Cabling."

3.03 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

B. Tests and Inspections:

1. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

3. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

    a. Check for electrical continuity of circuits and for short circuits.
    b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
    c. Verify that manual transfer warnings are properly placed.
    d. Perform manual transfer operation.

4. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
b. Simulate loss of phase-to-ground voltage for each phase of normal source.
c. Verify time-delay settings.
d. Verify pickup and dropout voltages by data readout or inspection of control settings.
e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
f. Perform contact-resistance test across main contacts and correct values exceeding 500 micro-ohms and values for 1 pole deviating by more than 50 percent from other poles.
g. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

5. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

a. Verify grounding connections and locations and ratings of sensors.

C. Coordinate tests with tests of generator and run them concurrently.

D. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

E. Remove and replace malfunctioning units and retest as specified above.

3.04 DEMONSTRATION

A. Engage a factory-authorized service representative to train OWNER's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment for one 8-hr man-day exclusive of travel and lodging time.

END OF SECTION

SECTION 16443

MOTOR-CONTROL CENTERS-INSTALLATION

PART 1 – GENERAL

This specification is for the CONTRACTOR installation of OWNER furnished equipment. PART 2- PRODUCTS is **REFERENCE ONLY**.

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes MCCs for use with ac circuits rated 600 V and less and having the following factory-installed components:

1. Incoming main lugs and OCPDs.
2. Reduced-voltage, solid-state controllers.
3. Feeder-tap units.
4. Ethernet/IP Communication
5. Panelboards
6. Transformers
7. Surge Protection Devices.
8. Instrumentation.
9. Auxiliary devices.

1.03 DEFINITIONS

A. Retain definition(s) remaining after this Section has been edited.

B. CE: Conformite European (European Compliance).

C. CPT: Control power transformer.

D. DDC: Direct digital control.

E. EMI: Electromagnetic interference.

F. GFCI: Ground fault circuit interrupting.

G. IGBT: Insulated-gate bipolar transistor.

H. LAN: Local area network.

I. LED: Light-emitting diode.

J. MCC: Motor-control center.

K. MCCB: Molded-case circuit breaker.

L. MCP: Motor-circuit protector.

M. NC: Normally closed.

N. NO: Normally open.

O. OCPD: Overcurrent protective device.

P. PCC: Point of common coupling.

Q. PID: Control action, proportional plus integral plus derivative.

R. PT: Potential transformer.

S. PWM: Pulse-width modulated.

T. RFI: Radio-frequency interference.

U. SCR: Silicon-controlled rectifier.

V. TDD: Total demand (harmonic current) distortion.

W. THD(V): Total harmonic voltage demand.

X. TVSS: Transient voltage surge suppressor.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of controller and each type of MCC. Include shipping and operating weights, features, performance, electrical ratings, operating characteristics, and furnished specialties and accessories.

B. Shop Drawings: For each MCC, manufacturer's approval, custom, and production drawings as defined in UL 845. In addition to requirements specified in UL 845, include dimensioned plans, elevations, and sections; and conduit entry locations and sizes, mounting arrangements, and details, including required clearances and service space around equipment.

1. Show tabulations of installed devices, equipment features, and ratings. Include the following:

a. Each installed unit's type and details.
b. Factory-installed devices.
c. Enclosure types and details.
d. Nameplate legends.
e. Short-circuit current (withstand) rating of complete MCC, and for bus structure and each unit.
f. Features, characteristics, ratings, and factory settings of each installed controller and feeder device, and installed devices.
g. Specified optional features and accessories.

2. Schematic and Connection Wiring Diagrams: For power, signal, and control wiring for each installed controller.

3. Nameplate legends.

4. Vertical and horizontal bus capacities.

5. Features, characteristics, ratings, and factory settings of each installed unit.

C. Harmonic Analysis Study and Report: Comply with IEEE 399 and NETA Acceptance Testing Specification; identify the effects of nonlinear loads and their associated harmonic contributions on the voltages and currents throughout the electrical system.

Analyze designated operating scenarios, including recommendations for VFC input filtering to limit TDD and THD(V) at the defined PCC to specified levels.

1.05 INFORMATIONAL SUBMITTALS

A. Standard Drawings: For each MCC, as defined in UL 845.

B. Production Drawings: For each MCC, as defined in UL 845.

C. Coordination Drawings: Floor plans, drawn to scale, showing dimensioned layout, required working clearances, and required area above and around MCCs where pipe and ducts are prohibited. Show MCC layout and relationships between electrical components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support. Indicate field measurements.

D. Qualification Data: For qualified testing agency.

E. Product Certificates: For each MCC, from manufacturer.

F. Source quality-control reports.

G. Field quality-control reports.

H. Load-Current and Overload-Relay Heater List: Compile after motors have been installed and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.

I. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed and arrange to demonstrate that switch settings for motor running overload protection suit actual motors to be protected.

J. Warranty: Sample of special warranty.

1.06 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For MCCs, all installed devices, and components to include in emergency, operation, and maintenance manuals. Include the following:

1. Manufacturer's Record Drawings: As defined in UL 845. In addition to requirements specified in UL 845, include field modifications and field-assigned wiring identification incorporated during construction by manufacturer, Contractor, or both.

2. Manufacturer's written instructions for testing and adjusting circuit breaker and MCP trip settings.

3. Manufacturer's written instructions for setting field-adjustable overload relays.

4. Manufacturer's written instructions for testing, adjusting, and reprogramming reduced-voltage, solid-state controllers.

5. Manufacturer's written instructions for testing, adjusting, and reprogramming microprocessor control modules.

6. Manufacturer's written instructions for setting field-adjustable timers, controls, and status and alarm points.

1.07 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Control Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
3. Indicating Lights: Two of each type and color installed.
4. Auxiliary Contacts: Furnish one spare(s) for each size and type of magnetic controller installed.
5. Power Contacts: Furnish three spares for each size and type of magnetic contactor installed.

1.08 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Source Limitations: Obtain MCCs and controllers of a single type from single source from single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver MCCs in shipping splits of lengths that can be moved past obstructions in delivery paths.

1. The OWNER shall coordinate the shipping splits with the MCC manufacturer for entry into the building.
2. Shipping splits shall be noted on the MCC manufacturer drawings.
3. MCCs are to be shipped with external lifting angles at the top and running continuously for each shipping split. Lifting eyelets are not acceptable.

B. Handle MCCs according to the following:

1. NEMA ICS 2.3, "Instructions for the Handling, Installation, Operation, and Maintenance of Motor Control Centers Rated Not More Than 600 Volts."
2. NECA 402, "Recommended Practice for Installing and Maintaining Motor Control Centers."

C. If stored in space that is not permanently enclosed and air conditioned, remove loose packing and flammable materials from inside MCCs; install temporary electric heating, with at least 250 W per vertical section.

1.10 ENVIRONMENTAL REQUIREMENTS

A. The MCC enclosure rating shall be appropriate for the environment where the MCC is to be located.

1.11 FIELD MEASUREMENTS

A. The manufacturer shall submit equipment dimensions to verify all field measurements prior to the fabrication of the MCC.

1.12 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than 0 deg F (minus 18 deg C) and not exceeding 104 deg F (40 deg C), with an average value exceeding 95 deg F (35 deg C) over a 24-hour period.
2. Ambient Storage Temperature: Not less than minus 4 deg F (minus 20 deg C) and not exceeding 140 deg F (60 deg C).
3. Humidity: Less than 95 percent (noncondensing).
4. Altitude: Not exceeding 6600 feet (2000 m), or 3300 feet (1000 m) if MCC includes solid-state devices.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for MCCs, including clearances between MCCs and adjacent surfaces and other items.

1.13 COORDINATION

A. Coordinate sizes and locations of concrete bases. Cast anchor-bolt inserts into bases.

B. Coordinate features of MCCs, installed units, and accessory devices with remote pilot devices and control circuits to which they connect.

C. Coordinate features, accessories, and functions of each MCC, each controller, and each installed unit with ratings and characteristics of supply circuits, motors, required control sequences, and duty cycle of motors and loads.

1.14 REGULATORY REQUIREMENTS

A. Contractor shall ensure that the installation conforms to the requirements of the latest edition of the NFPA 70 ‘National Electrical Code’ and/or other applicable installation standards.

1.15 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace all devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 – PRODUCTS (REFERENCE ONLY)

2.01 MANUFACTURED UNITS

A. Subject to compliance with requirements, provide products by one of the following:

1. ABB.
2. Eaton Corporation
3. Schneider Electric
4. Engineer Approved Equivalent.

B. General Requirements for MCCs: Comply with NEMA ICS 18 and UL 845

2.02 FUNCTIONAL FEATURES

A. Description: Modular arrangement of main units, controller units, control devices, feeder-tap units, instruments, metering, auxiliary devices, and other items mounted in vertical sections of MCC.

B. Controller Units: Combination controller units.

1. Install units up to and including Size 3 on draw out mountings with connectors that automatically line up and connect with vertical-section buses while being racked into their normal, energized positions.
2. Equip units in Type B and Type C MCCs with pull-apart terminal strips for external control connections.

C. Feeder-Tap Units: Units rated 225-A and below shall have draw out mountings with connectors that automatically line up and connect with vertical-section buses while

D. Future Units: Compartments fully bused and equipped with guide rails or equivalent, ready for insertion of draw out units.

E. Spare Units: Installed in compartments indicated "spare."

2.03 ETHERNET/IP COMMUNICATION

A. The MCC shall have Ethernet wiring incorporated into its design.

1. The MCC shall have Ethernet cabling incorporated throughout the vertical sections.
2. Each power monitor, motor starter, AC drive and soft starter unit in the MCC shall be supplied with a means to communicate via Ethernet/IP networks.
3. Each MCC Shall have Industrial Ethernet Switches with ports and configurations as required. See the Project Plans.

B. Ethernet Cabling.

1. Ethernet Cable Ratings

a. The Ethernet cable shall be 600V UL PLTC rated.

b. The use of a 300V rated cable is not acceptable.

2. Layout

a. Cable shall connect each section to one another in the top or bottom wireways.
b. Ethernet cable through the MCC section shall be routed from the top or bottom wireways. To prevent accidental mechanical damage during MCC installation, the cable shall be located behind barriers to isolate the cable from the unit space and wireways.
c. Ethernet ports shall be provided in the rear of each vertical wireway of standard sections to simplify installation, relocation, and addition of plug-in units.
d. The EtherNet/IP device within each unit shall be factory connected to an Ethernet port in the vertical wireway by using a 600V-rated Ethernet cable.

3. Power Supplies

a. The power supply shall provide 24V DC for the devices that require it.
b. The MCC manufacturer shall check the user's design to ensure that adequate power supplies have been specified to conform with network requirements.
c. Power supply output shall be rated 8 A, 24V DC
d. The power supply unit shall be provided with a buffer module to provide a minimum of 500 ms ride-through at full load.

C. Ethernet/IP Interface for Solid-State Reduced Voltage Motor Controllers.

1. The Ethernet/IP communication interface shall be supplied to allow for communication between the solid-state component and the Ethernet network.

D. Ethernet/IP Interface for Other Units.

1. Provide Ethernet/IP interface for other units as required to support the project needs.

2. Refer to the contract drawing wiring diagrams for points to be monitored.

E. Programming and Testing.

1. The MCC manufacturer shall load the IP Address into each unit.

2. The IP Address shall be as provided by the OWNER.

3. The MCC manufacturer shall test the MCC to ensure that each unit communicates properly prior to shipment.

4. Each unit shall have a label showing the IP Address for the devices within it.

5. The MCC manufacturer shall provide a disk containing applicable electronic data sheet (EDS) files for the Ethernet/IP devices.

2.04 INCOMING MAINS

A. Incoming Mains Location: as indicated on the contract drawings.

B. Main Lugs Only: Conductor connectors suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type.

2.05 REDUCED-VOLTAGE SOLID-STATE CONTROLLERS

A. Controller Units: An integrated unit with disconnects, power SCRs, heat sink, microprocessor logic board, door-mounted digital display and keypad, bypass contactor, and overload relays. Comply with UL 508.

1. Suitable for use with NEMA MG 1 Design B, polyphase induction motors.

B. Disconnects:

1. Fusible Switch:

a. UL 98 and NEMA KS 1, heavy-duty, horsepower-rated fusible switch, with clips or bolt pads to accommodate Class J fuses.
b. Lockable Handle: For three padlocks and interlocks with cover in closed position.

2. MCP:

a. UL 489, with interrupting capacity complying with available fault currents, instantaneous-only circuit breaker with front-mounted, field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.
b. Lockable Handle: For three padlocks and interlocks with cover in closed position.
c. Auxiliary contacts "a" and "b" arranged to activate with MCP handle.
d. [NC] [NO] alarm contact that operates only when MCP has tripped.
e. Current-limiting module to increase controller short-circuit current (withstand) rating to 100 kA.

3. MCCB:

a. UL 489, with interrupting capacity to comply with available fault currents; thermal-magnetic MCCB, with inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits.
b. Front-mounted, adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
c. Lockable Handle: For three padlocks and interlocks with cover in closed position.
d. Auxiliary contacts "a" and "b" arranged to activate with MCCB handle.
e. [NC] [NO] alarm contact that operates only when MCCB has tripped.

4. Molded-Case Switch:

a. UL 489, with in-line fuse block for UL 248-8 Class J or L power fuses (depending on ampere rating), providing an interrupting capacity to comply with available fault currents; MCCB with fixed, high-set instantaneous trip only.
b. Lockable Handle: For three padlocks and interlocks with cover in closed position.
c. Auxiliary contacts "a" and "b" arranged to activate with molded-case switch handle.

d. [NC] [NO] alarm contact that operates only when molded-case switch has tripped.

C. Configuration: As indicated on the contract drawings.

D. Starting Mode: Voltage ramping, Current limit, Torque control, Torque control with voltage boost; field selectable.

E. Stopping Mode: Coast to stop, Adjustable torque deceleration, Adjustable braking; field selectable.

F. Bypass Contactor: Shall operate automatically to bypass the SCRs when the motor has reached rated speed and full voltage is applied to motor. Solid-state controller protective features shall remain active when the bypass relay is in the bypass mode.

1. Bypass Contactor: Manufacturer's standard product.

2. Bypass Contactor Coils: Pressure-encapsulated type; manufacturer's standard operating voltage, matching control power or line voltage, depending on contactor size and line-voltage rating.

G. Acceleration Control: Adjustable, using voltage or current ramp, and adjustable starting torque control with up to 400 percent current limitation for 20 seconds.

H. SCR Bridge: At least two SCRs per phase, for stable and smooth acceleration without external feedback from the motor or driven equipment.

I. Keypad: Front accessible; for programming the controller parameters, functions, and features; shall be manufacturer's standard and include not less than the following functions:

1. Adjusting motor full-load amperes, as a percentage of the controller's rating.

2. Adjusting current limitation on starting, as a percentage of the motor full-load current rating.

3. Adjusting linear acceleration and deceleration ramps, in seconds.

4. Setting initial torque, as a percentage of the nominal motor torque.

5. Adjusting torque limit, as a percentage of the nominal motor torque.

6. Adjusting maximum start time, in seconds.

7. Adjusting voltage boost, as a percentage of the nominal supply voltage.

8. Selecting stopping mode and adjusting parameters.

9. Selecting motor thermal-overload protection class between 5 and 30.

10. Activating and deactivating protection modes.

11. Selecting or activating communications modes.

J. Digital Display: Front accessible; for showing motor, controller, and fault status; shall be manufacturer's standard and include not less than the following:

1. Controller Condition: Ready, starting, running, stopping.

2. Motor Condition: Amperes, voltage, power factor, power, and thermal state.

3. Fault Conditions: Controller thermal fault, motor overload alarm and trip, motor underload, overcurrent, shorted SCRs, line or phase loss, phase reversal, and line frequency over or under normal.

K. Controller Diagnostics and Protection:

1. Microprocessor-based thermal protection system for monitoring SCR and motor thermal characteristics, and providing controller overtemperature and motor overload alarm and trip; settings selectable via the keypad.
2. Protection from line-side reverse phasing; line-side and motor-side phase loss; motor jam, stall, and underload conditions; and line frequency excursions to over- or under-normal. Accomplish protection by the following:
    a. Input isolation contactor that opens when the controller diagnostics detect a faulted solid-state component, or when the motor is stopped.

L. Remote Output Features:

1. All outputs prewired to terminal blocks.
2. Form C status contacts that change state when controller is running.
3. Form C alarm contacts that change state when a fault condition occurs.

M. Overload Relays:

1. Solid-State Overload Relays:
    a. Switch or dial selectable for motor-running overload protection.
    b. Sensors in each phase.
    c. Class 10/20 selectable tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.
    d. UL 1053, Class II ground-fault protection, with start and run delays to prevent nuisance trip on starting.

N. Ethernet/IP Interface for Motor Starter Units.

1. Motor starter units shall have an electronic overload relay that incorporates the following features:
    a. Built-in Ethernet/IP communication
    b. LEDs for status indication
    c. Test/Reset button.
    d. Selectable trip of NEMA Class 5 to 30. Unless indicated, the trip class shall be set for NEMA Class 20 operation.
    e. Refer to the contract drawings for connection requirements.
    f. Protective functions
        i. Functions shall provide a programmable trip level, warning level, time delay, and inhibit window.
        ii. Protective functions shall include Thermal overload, Phase loss, Stall, Jam, Underload, Current imbalance, Remote trip, and PTC thermistor input.

iii. Ground fault protection is required. The protection range shall be 1 A to 5 A for NEMA Size 3 and smaller starters, and 20 mA to 5 A for NEMA Size 4 and larger starters.

g. Current monitoring functions shall include phase current, average current, full load current, current imbalance percent, percent thermal capacity utilized, and ground fault current (if required)
h. Voltage, energy, and frequency measuring capabilities shall be included.
i. Diagnostic information shall include device status, warning status, time to reset, trip status, time to overload trip, and history of last five trips.
j. Preventive maintenance information shall include Allowable starts per hour, required Time between starts, starts counter, Starts available, Time until next start, total operating hours, and elapsed operating time.
k. Overload relay shall include an on-board logic processor to allow basic logic to be performed within the overload relay based on network data and the status of the inputs to the overload relay.
l. The overload relay shall support the following CIP messaging types: Polled I/O messaging, Change-of-state/cyclic messaging, Explicit messaging, Group 4 offline node recovery messaging, and Unconnected Message Manager (UCMM).
m. The overload relay shall provide the following functions to minimize network configuration time: Full parameter object support, Configuration consistency value, and Add-on Profile.

O. Optional Features:

1. Additional field-assignable Form C contacts for alarm outputs.

2. Surge suppressors in solid-state power circuits providing three-phase protection against damage from supply voltage surges 10 percent or more above nominal line voltage.

2.06 PANELBOARDS

A. Comply with NEMA PB 1.

B. Branch OCPDs for Circuit-Breaker Frame Sizes 125 A and Smaller: Plug-in circuit breakers.

C. Branch OCPDs for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; or plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

D. Contactors can be incorporated to switch the entire panelboard or only a portion of the circuits. Coordinate with Drawings and schedules to indicate contactor connections, type, quantity of circuits controlled, current ratings, external control circuits, and number of poles. Consult manufacturers for their respective limitations on and availability of short-circuit ratings and electrically held contactors, which may not be available from all manufacturers.

E. Contactors in Main Bus: NEMA ICS 2, Class A, general-purpose controller, with same short-circuit interrupting rating as panelboard.

2.07 TRANSFORMERS

A. Factory-assembled and tested, air-cooled, two-winding, low-voltage dry-type transformers; with primary circuit breaker. Comply with NEMA ST 20.

B. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.

C. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 115 deg C rise above 40 deg C ambient temperature.

2.08 FEEDER-TAP UNITS

A. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Electronic trip settings for circuit-breaker frame sizes 250 A and larger.

2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:

a. Instantaneous trip.
b. Long- and short-time pickup levels.
c. Long- and short-time time adjustments.
d. Ground-fault pickup level, time delay, and I^2t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.

5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.

6. MCCB Features and Accessories:

a. Standard frame sizes, trip ratings, and number of poles.
b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.
c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
e. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
f. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
g. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.

h. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
i. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.

2.09 TRANSIENT VOLTAGE SUPPRESSION DEVICES

A. SPDs: Comply with UL 1449, Type 2.

1. Include LED indicator lights for power and protection status.

2. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.

3. Include Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status

B. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 100 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

C. Protection modes and UL 1449 VPR for grounded wye circuits with, three-phase, four-wire circuits shall not exceed the following:

1. Line to Neutral: 1200 V for 480Y/277 V or 700 V for 208Y/120 V & 240/120 V.

2. Line to Ground: 1200 V for 480Y/277 V or 700 V for 208Y/120 V & 240/120 V.

3. Neutral to Ground: 1200 V for 480Y/277 V or 700 V for 208Y/120 V & 240/120 V.

4. Line to Line: 2000 V for 480Y/277 V or 1200 V for 208Y/120 V & 240/120 V.

D. Protection modes and UL 1449 VPR for 240/120-V, single-phase, three-wire circuits shall not exceed the following:

1. Line to Neutral: 600V.

2. Line to Ground: 600V.

3. Neutral to Ground: 600V.

4. Line to Line: 1000V.

E. SCCR: Equal or exceed 100K AIC min or per the one-line diagram

F. Nominal Discharge Current (In) Rating: 20 kA

G. Sinewave Tracking/Frequency Responsive Capability.

1. SPDs installed to protect MCCs serving sensitive electronic equipment shall utilize voltage independent, frequency responsive dedicated Sinewave Tracking circuitry to mitigate the effects of switching or ringing surges.

a. Sensitive Electronic Equipment shall include, but is not limited to:

i. Variable Frequency Controllers

ii. Lighting with Electronic Ballasts

2. EMI/RFI filtering specifically will not be considered as equal to sinewave tracking.

3. Devices with Sinewave Tracking circuitry shall be tested in accordance with the latest edition of IEEE C62.41.2 for a Category A Ring Wave (2000 volt – 67-amp ring wave)
    a. The maximum amplitude shall be less than 50V peak deviation from the insertion point of the surge on the sine wave to the peak of the transient.

2.10 INSTRUMENTATION

A. Instrument Transformers: IEEE C57.13, NEMA EI 21.1, and the following:
    1. PTs: IEEE C57.13; 120 V, 60 Hz, single secondary; disconnecting type with integral fuse mountings. Burden and accuracy shall be consistent with connected metering and relay devices.
    2. Current Transformers: IEEE C57.13; 5 A, 60 Hz, secondary; bar or window type; single secondary winding and secondary shorting device. Burden and accuracy shall be consistent with connected metering and relay devices.
    3. CPTs: Dry type, mounted in separate compartments for units larger than 3 kVA.
    4. Current Transformers for Neutral and Ground-Fault Current Sensing: Connect secondary wiring to ground overcurrent relays, via shorting terminals, to provide selective tripping of main and tie circuit breaker. Coordinate with feeder circuit-breaker, ground-fault protection.

B. Multifunction Digital-Metering Monitor: Microprocessor-based unit suitable for three- or four-wire systems and with the following features:
    1. Listed or recognized by a nationally recognized testing laboratory.
    2. Inputs from sensors or 5-A current-transformer secondaries, and potential terminals rated to 600 V.
    3. Switch-selectable digital display of the following values with the indicated maximum accuracy tolerances:
        a. Phase Currents, Each Phase: Plus, or minus 1 percent.
        b. Phase-to-Phase Voltages, Three Phase: Plus, or minus 1 percent.
        c. Phase-to-Neutral Voltages, Three Phase: Plus, or minus 1 percent.
        d. Three-Phase Real Power (Megawatts): Plus, or minus 2 percent.
        e. Three-Phase Reactive Power (Megavars): Plus, or minus 2 percent.
        f. Power Factor: Plus, or minus 2 percent.
        g. Frequency: Plus, or minus 0.5 percent.
        h. Accumulated Energy, Megawatt Hours: Plus, or minus 2 percent; accumulated values unaffected by power outages up to 72 hours.
        i. Megawatt Demand: Plus, or minus 2 percent; demand interval programmable from five to 60 minutes.
        j. Contact devices to operate remote impulse-totalizing demand meter.
    4. Mounting: Display and control unit flush or semi flush mounted in instrument compartment door.

C. Ammeters, Voltmeters, and Power-Factor Meters: ANSI C39.1.

1. Meters: 4-inch (100-mm) diameter or 6 inches (150 mm) square, flush or semi flush, with antiparallax 250-degree scale and external zero adjustment.
2. Voltmeters: Cover an expanded-scale range of nominal voltage plus 10 percent.

D. Instrument Switches: Rotary type with off position.

1. Voltmeter Switches: Permit reading of all phase-to-phase voltages and phase-to-neutral voltages where a neutral is included.
2. Ammeter Switches: Permit reading of current in each phase and maintain current-transformer secondaries in a closed-circuit condition at all times.

E. Feeder Ammeters: 2-1/2-inch (64-mm) minimum size with 90- or 120-degree scale. Meter and transfer device with off position, located on overcurrent device door for feeder circuits, unless otherwise indicated.

F. Watt-Hour Meters and Watt-meters:

1. Comply with ANSI C12.1.
2. Three-phase induction type with two stators, each with current and potential coil, rated 5 A, 120 V, 60 Hz.
3. Suitable for connection to three- and four-wire circuits.
4. Potential indicating lamps.
5. Adjustments for light and full load, phase balance, and power factor.
6. Four-dial clock register.
8. Integral demand indicator.
9. Contact devices to operate remote impulse-totalizing demand meter.
10. Ratchets to prevent reverse rotation.
11. Removable meter with draw out test plug.
12. Semi flush mounted case with matching cover.
13. Appropriate multiplier tag.

G. Impulse-Totalizing Demand Meter:

1. Comply with ANSI C12.1.
2. Suitable for use with MCC watt-hour meter, including two-circuit totalizing relay.
3. Cyclometer.
4. Four-dial, totalizing kilowatt-hour register.
5. Positive chart drive mechanism.
6. Capillary pen holding a minimum of one month's ink supply.
7. Roll chart with minimum 31-day capacity; appropriate multiplier tag.
8. Capable of indicating and recording 15-minute integrated demand of totalized system.

2.11 MCC CONTROL POWER

A. Control Circuits: 120-V ac, supplied through secondary disconnecting devices from CPT.

B. Control Power Fuses: Primary and secondary fuses for current-limiting and overload protection of transformer and fuses for protection of control circuits.

C. Control Wiring: Factory installed, with bundling, lacing, and protection included. Provide flexible conductors for No. 8 AWG and smaller, for conductors across hinges, and for conductors for interconnections between shipping units.

2.12 ENCLOSURES

A. Indoor Enclosures: Freestanding steel cabinets unless otherwise indicated. NEMA 250, Type 1 unless otherwise indicated to comply with environmental conditions at installed location.

B. Enclosure Finish for Indoor Units: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal surface.

C. Compartments: Modular; individual lift-off doors with concealed hinges and quick-captive screw fasteners. Interlocks on units requiring disconnecting means in off position before door can be opened or closed, except by operating a permissive release device.

D. Interchangeability: Compartments constructed to allow for removal of units without opening adjacent doors, disconnecting adjacent compartments, or disturbing operation of other units in MCC; same size compartments to permit interchangeability and ready rearrangement of units, such as replacing three single units with a unit requiring three spaces, without cutting or welding.

E. Each section shall be equipped with two full-metal side sheets to isolate each vertical section and to help reduce the likelihood of fault propagation between sections

2.13 STRUCTURE

A. The MCC shall be of dead front construction and shall consist of one or more vertical sections bolted together to form a rigid, free-standing assembly. The systems shall be designed to allow for the addition of future sections at either end also to permit the interchanging of units.

B. Vertical sections shall be rigid, free-standing structures.

1. Vertical sections shall have internal mounting angles running continuously within the shipping block.

2. An external mounting channel that is required to maintain structure integrity is not acceptable.

3. Vertical sections shall be 90 in. high, 20 in. deep(30 in. deep when using draw out mounted equipment) and 20 in. Wide, except where larger dimensions are required.

4. Vertical sections shall be provided with a removable steel lifting angle on all shipping blocks. The angle shall run the length of the shipping block

5. Lifting eyes are not acceptable
6. Each standard section shall be capable of being subdivided into 12 usable, unit spaces
7. Two unit spaces shall constitute one space factor and shall be 13 in. in height
8. One unit space shall constitute one-half space factor and shall be 6.5 in. in height

C. Horizontal wireways.

1. Horizontal wireways shall be located at the top and bottom of the MCC.
2. Horizontal wireways shall be 6 in. in height and extend the full depth of the vertical section to allow maximum flexibility in locating conduit for MCC feeds and loads.
3. Pull-boxes to extend the height of the top horizontal wireway by 12 in. shall be provided, if specified on the contract drawings
4. Horizontal wireways shall be continuous across the length of the MCC, except where access needs to be denied due to electrical isolation requirements.
5. The horizontal wireways shall be isolated from the power bus.
6. The horizontal wireways shall have removable covers held in place by captive screws

D. Provide a full height vertical wireway, independent of the plug-in units, in each standard vertical section.

1. The vertical wireway shall be isolated from the vertical and horizontal buses.
2. The vertical wireway shall be covered with a hinged and secured door.
3. Wireway tie bars shall be provided.
4. Isolation between the wireway and units shall be provided.

2.14 UNIT INFORMATION

A. The minimum compartment height shall be 6.5 in., and this shall be considered one-half space factor.

B. Plug-in units.

1. Plug-in units shall consist of a unit assembly, unit support pan, and unit door assembly.
2. Units shall be supplied with removable doors. The unit doors shall be fastened to the structure so that the doors can be closed when the unit is removed.
3. A unit support pan shall be provided for support and guiding units. Unit support pans shall remain in the structure when units are removed to provide isolation between units.
4. A service position shall be provided for plug-in units that allows for the unit to be supported but disengaged from the bus. The unit shall be capable of being padlocked in the service position. This position is to be used to isolate a unit from the bus to allow service to be performed on the connected load equipment.

C. Power Stabs.

1. Unit stabs for engaging the power bus shall be tin-plated copper and provided with stainless back-up springs to provide and maintain a high pressure 4-point connection to the vertical bus.
2. Wiring from the unit disconnecting means to the plug-in stabs shall not be exposed on the rear of the unit. A separate isolated pathway shall be provided for each phase to minimize the possibility of unit fault conditions reaching the power bus system.
3. The power cable termination at the plug-in stab shall be a maintenance-free crimp type connection.
4. The shutters shall automatically open before the power stabs can extend and connect to the vertical bus.
5. The shutters shall close as soon as the power stabs are disconnected from the vertical bus and are completely inside the stab housing.

2.15 AUXILIARY DEVICES

A. General Requirements for Control-Circuit and Pilot Devices: NEMA ICS 5; factory installed in controller enclosure cover unless otherwise indicated.

1. Push Buttons, Pilot Lights, and Selector Switches: Heavy-duty, oil tight type, 30mm.
    a. Push Buttons: Unguarded types; momentary contact unless otherwise indicated.
    b. Pilot Lights: LED types; push to test.
    c. Selector Switches: Rotary type.
2. Elapsed-Time Meters: Heavy duty with digital readout in hours; non-resettable.
4. Meters: Panel type, 2-1/2-inch (64-mm) minimum size with 90- or 120-degree scale and plus or minus 2 percent accuracy with selector switches having an off position.

B. Reversible NC/NO contactor auxiliary contact(s).

C. Control Relays: Auxiliary and adjustable solid-state time-delay relays.

D. Phase-Failure, Phase-Reversal, and Undervoltage and Overvoltage Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connections. Provide adjustable undervoltage, overvoltage, and time-delay settings.

E. Space heaters: Factory-installed electric space heaters of sufficient wattage in each vertical section to maintain enclosure temperature above expected dew point.

1. Space-Heater Control: Thermostats to maintain temperature of each section above expected dew point.
2. Space-Heater Power Source: Transformer, factory installed in MCC.

F. Cover gaskets for Type 1 enclosures.

G. Terminals for connecting power factor correction capacitors to the line side of overload relays.

H. Spare control-wiring terminal blocks; wired.

I. pare-Fuse Cabinet: Identified cabinet with hinged lockable door.

2.16 CHARACTERISTICS AND RATINGS

A. Wiring: NEMA ICS 18, Class I Type B-T, for starter Size 3 and below. Provide terminals as shown on the drawings.

B. Control and Load Wiring: Factory installed, with bundling, lacing, and protection included. Provide flexible conductors for No. 8 AWG and smaller, for conductors across hinges, and for conductors for interconnections between shipping units.

C. Nominal System Voltage: as specified on the contract drawings.

D. Short-Circuit Current Rating for Each Unit: as specified on the contract drawings.

E. Short-Circuit Current Rating of MCC: as specified on the contract drawings.

F. Main-Bus Continuous Rating: as specified on the contract drawings.

G. Vertical-Bus Minimum Continuous Rating: as required to supply the desired in the vertical section, 600A minimum.

H. Horizontal and Vertical Bus Bracing (Short-Circuit Current Rating): Match MCC short-circuit current rating.

I. Main Horizontal and Equipment Ground Buses: Uniform capacity for entire length of MCC's main and vertical sections. Provide for future extensions from both ends. Brace bus extensions for busway feeder bus.

J. Vertical Phase and Equipment Ground Buses: Uniform capacity for entire usable height of vertical sections, except for sections incorporating single units.

K. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity, tin plated.

L. Phase and Neutral-Bus Material: Tin-plated, high-strength, electrical-grade aluminum alloy

M. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with mechanical connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.

N. Ground Bus: Minimum size required by UL 845, hard-drawn copper of 98 percent conductivity, equipped with mechanical connectors for feeder and branch-circuit equipment grounding conductors. For busway feeders, extend insulated equipment grounding cable to busway ground connection and support cable at intervals in vertical run.

O. Front-Connected, Front-Accessible MCCs:

1. Main Devices: Draw out mounted.

2. Controller Units: Draw out and fixed mounted.

3. Feeder-Tap Units: Draw out and fixed mounted.
4. Sections front and rear aligned.

P. Owner Metering Compartment: A separate customer metering compartment and section with front hinged door, metering, and current transformers for each meter. Current transformer secondary wiring shall be terminated on shorting-type terminal blocks. Include potential transformers having primary and secondary fuses with disconnecting means and secondary wiring terminated on terminal blocks.

Q. Bus Transition and Incoming Pull Sections: Matched and aligned with basic MCC.

R. Pull Box on Top of an MCC:

1. Adequate ventilation to maintain temperature in pull box within same limits as MCC.
2. Set back from front to clear circuit-breaker removal mechanism.
3. Removable covers forming top, front, and sides. Top covers at rear easily removable for drilling and cutting.
4. Insulated bottom of fire-resistive material with separate holes for cable drops into MCC.
5. Cable supports arranged to facilitate cabling and adequate to support cables, including those for future installation.
6. Isolation Barrier Access Provisions: Permit checking of bus-bolt tightness.

S. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of unit.

T. Bus-Bar Insulation: Factory-applied, flame-retardant, tape wrapping of individual bus bars or flame-retardant, spray-applied insulation. Minimum insulation temperature rating of 105 deg C.

U. Fungus Proofing: Permanent fungicidal treatment for OCPDs and other components including instruments and instrument transformers.

2.17 SOURCE QUALITY CONTROL

A. MCC Testing: Inspect and test MCCs according to requirements in NEMA ICS 18.

B. MCCs will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

PART 3 – EXECUTION

3.01 EXAMINATION BY OWNER AND CONTRACTOR

A. Examine areas and surfaces to receive MCCs, with Installer present, for compliance with requirements for installation tolerances, and other conditions affecting performance of the Work.

B. Examine enclosed controllers before installation. Reject enclosed controllers that are wet, moisture damaged, or mold damaged.

C. Contractor to proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Coordinate layout and installation of MCCs with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Floor-Mounting Controllers: Install MCCs on 4-inch nominal thickness concrete base.

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.

2. For supported equipment, install drilled and epoxied anchors that extend through concrete base and anchor into structural concrete floor.

3. Use setting drawings, templates, diagrams, instructions, and directions furnished with the equipment.

4. Install drilled and epoxied anchors to elevations required for proper attachment to supported equipment.

C. Temporary Lifting Provisions: Remove temporary lifting channels and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in each fusible switch.

E. Install fuses in control circuits if not factory installed.

F. Install heaters in thermal-overload relays. Select heaters based on actual nameplate full-load amperes after motors have been installed.

G. Install, connect, and fuse thermal-protector monitoring relays furnished with motor-driven equipment.

H. Comply with NECA 1.

3.03 IDENTIFICATION

A. Comply with requirements in Section 16075 "Identification for Electrical Systems" for identification of MCC, MCC components, and control wiring.

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.

2. Label MCC and each cubicle with engraved nameplate.

3. Label each enclosure-mounted control and pilot device.

5. Mark up a set of manufacturer's connection wiring diagrams with field-assigned wiring identifications and return to manufacturer for inclusion in Record Drawings.

B. Operating Instructions: Frame printed operating instructions for MCCs, including control sequences and emergency procedures. Fabricate frame of finished metal and cover instructions with clear acrylic plastic. Mount on front of MCCs.

3.04 CONTROL WIRING INSTALLATION

A. Bundle, train, and support wiring in enclosures.

B. Connect selector switches and other automatic-control selection devices where applicable.

1. Connect selector switches to bypass only those manual- and automatic-control devices that have no safety functions when switch is in manual-control position.

2. Connect selector switches within enclosed controller circuit in both manual and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.05 CONNECTIONS

A. Comply with requirements for installation of conduit in Section 16130 "Raceways and Boxes." Drawings indicate general arrangement of conduit, fittings, and specialties.

B. Comply with requirements in Section 16060 "Grounding and Bonding."

3.06 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed controller, component, connecting supply, feeder, and control circuit.

2. Test continuity of each circuit.

E. Tests and Inspections:

1. Inspect controllers, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.

2. Test insulation resistance for each enclosed controller element, component, connecting motor supply, feeder, and control circuits.

3. Test continuity of each circuit.

4. Verify that voltages at controller locations are within 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Engineer and Owner before starting the motor(s).

5. Test each motor for proper phase rotation.

6. Perform each electrical test and visual and mechanical inspection stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
8. Perform the following infrared (thermographic) scan tests and inspections and prepare reports:
    a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each multipole enclosed controller. Remove front panels so joints and connections are accessible to portable scanner.
    b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each multipole enclosed controller 11 months after date of Substantial Completion.
    c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
9. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
10. Mark up a set of manufacturer's drawings with all field modifications incorporated during construction and return to manufacturer for inclusion in Record Drawings.

F. Enclosed controllers will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports, including a certified report that identifies enclosed controllers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.07 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.08 ADJUSTING

A. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and overload-relay pickup and trip ranges.

B. Adjust overload relay heaters or settings if power factor correction capacitors are connected to the load side of the overload relays.

C. Adjust the trip settings of MCPs and thermal-magnetic circuit breakers with adjustable, instantaneous trip elements. Initially adjust to six times the motor nameplate full-load amperes and attempt to start motors several times, allowing for motor cool-down between starts. If tripping occurs on motor inrush, adjust settings in increments until motors start without tripping. Do not exceed eight times the motor full-load amperes (or 11 times for NEMA Premium Efficient motors if required). Where these maximum

settings do not allow starting of a motor, notify Owner and Engineer before increasing settings.

D. Set field-adjustable switches and program microprocessors for required start and stop sequences in reduced-voltage, solid-state controllers.

E. Set field-adjustable circuit-breaker trip ranges as specified in Section 16055 “Overcurrent Protection Devices Arc Flash Study”.

3.09 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions until enclosed controllers are ready to be energized and placed into service.

B. Replace controllers whose interiors have been exposed to water or other liquids prior to Substantial Completion.

3.10 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain enclosed controllers, and to use and reprogram microprocessor-based, reduced-voltage, solid-state controllers.

END OF SECTION

SECTION 16491

FUSES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Apalachicola General Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Cartridge fuses rated 600-V ac and less for use in control circuits enclosed switches switchboards enclosed controllers and motor-control centers.
2. Spare-fuse cabinets.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material, dimensions, descriptions of individual components, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:

1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
    a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
    b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
3. Current-limitation curves for fuses with current-limiting characteristics.
4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse Coordination charts and tables and related data.
5. Fuse sizes for elevator feeders and elevator disconnect switches.

1.04 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in General Conditions Section, include the following:

1. Ambient temperature adjustment information.
2. Current-limitation curves for fuses with current-limiting characteristics.
3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse. Coordination charts and tables and related data.

1.05 MATERIALS MAINTENANCE SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than six of each size and type.

1.06 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

E. Comply with UL 248-11 for plug fuses.

1.07 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F (5 deg C) or more than 100 deg F (38 deg C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.08 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Bussmann, Inc.

2. Ferraz Shawmut, Inc.

3. Littlefuse, Inc.

2.02 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

2.03 SPARE-FUSE CABINET

A. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.

1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
2. Finish: Gray, baked enamel.
3. Identification: "SPARE FUSES" in 1-1/2-inch- (38-mm-) high letters on exterior of door.
4. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.

C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 FUSE APPLICATIONS

A. Cartridge Fuses:

1. Service Entrance: Per Approved Overcurrent Protection Study.
2. Feeders: Per Approved Overcurrent Study
3. Motor Branch Circuits: Class RK5, time delay.
4. Other Branch Circuits: Per Approved Overcurrent Protection Study
5. Control Circuits: Class CC, fast acting.

3.03 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

B. Install spare-fuse cabinet(s).

3.04 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Section 16075 "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

SECTION 16491

FUSES

END OF SECTION 16491

SECTION 16495

VARIABLE FREQUENCY MOTOR CONTROLLERS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes separately enclosed, preassembled, combination VFDs, rated 600 V and less, for speed control of three-phase, squirrel-cage induction motors.

1.03 RELATED SECTIONS

A. Section 16150 – Electric Motors

B. Section 16910 – Control Panel Construction

C. Section 16930 – Functional Description

1.04 DEFINITIONS

A. CPT: Control power transformer.

B. EMI: Electromagnetic interference.

C. LED: Light-emitting diode.

D. NC: Normally closed.

E. NO: Normally open.

F. OCPD: Overcurrent protective device.

G. PID: Control action, proportional plus integral plus derivative.

H. RFI: Radio-frequency interference.

I. VFC/VFD/AFD: Variable-frequency motor controller.

1.05 ACTION SUBMITTALS

A. All submittals shall be in accordance with Section 01300.

B. Product Data: For each type and rating of VFD indicated.

1. Include catalog information and datasheets for each model VFD supplied.
2. Include dimensions and finishes for VFDs.
3. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
4. Include data and calculations to support the minimum SCCR specified.

C. Shop Drawings: For each VFD indicated.

1. Include mounting and attachment details.

2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.
4. Include marking data per NEC 70, Article 409.110.
5. Where VFDs are installed in 3rd party fabricated control panels, include datasheets and catalog information for all components utilized in the design and construction of the VFD control panel.

1.06 INFORMATIONAL SUBMITTALS

A. All submittals shall be in accordance with Section 01300.

B. Coordination Drawings: Floor plans, drawn to scale, showing dimensioned layout, which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Required working clearances and required area above and around VFDs.
2. Show VFD layout and relationships between electrical components and adjacent structural and mechanical elements.
3. Show support locations, type of support, and weight on each support.
4. Indicate field measurements.

C. Product Certificates: For each VFD from manufacturer.

D. Harmonic Analysis Study and Report: Comply with IEEE 519 and NETA Acceptance Testing Specification; identify the effects of nonlinear loads and their associated harmonic contributions on the voltages and currents throughout the electrical system. Analyze possible operating scenarios, including recommendations for VFD input filtering and active correction to limit TDD and THD(V) at the defined PCC to specified levels. PCC shall be defined at the primary side of the main service transformer.

E. Source quality-control reports.

F. Field quality-control reports.

G. Sample Warranty: For special warranty.

1.07 O&M SUBMITTALS

A. Operation and Maintenance Data: For VFDs include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 01730 Operation and Maintenance Data, include the following:

a. Manufacturer's written instructions for testing and adjusting thermal-magnetic circuit breaker and motor-circuit protector trip settings.
b. Manufacturer's written instructions for setting field-adjustable overload relays.
c. Manufacturer's written instructions for testing, adjusting, and reprogramming microprocessor control modules.

d. Manufacturer's written instructions for setting field-adjustable timers, controls, and status and alarm points.
e. Load-Current and Overload-Relay Heater List: Compile after motors have been installed and arrange to demonstrate that selection of heaters suits actual motor nameplate, full-load currents.
f. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed and arrange to demonstrate that switch settings for motor-running overload protection suit actual motors to be protected.

1.08 QUALITY ASSURANCE

A. Manufacturer Qualifications: Maintain a service center capable of providing training, parts, and emergency maintenance repairs within a response period of less than eight hours from time of notification. An authorized VFD technician employed by the VFD manufacturer shall perform startup service and basic operational training for the owner or an owner's representative following VFD installation.

B. Source Limitations: Obtain VFDs Through one source from a single manufacturer.

1. All VFD's shall be of the same series, and shall utilize a common control card and LCP (keypad/display unit) throughout the rating range. The control cards and keypads shall be interchangeable through the entire range of drives used on the project.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with NFPA 70.

1.09 SPARE PARTS

A. Furnish spare parts that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

2. Control Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.

3. Indicating Lights: Two of each type and color installed.

4. Relays: Two of each type and style installed.

5. Terminal Blocks: 10 percent spare terminal blocks installed within the equipment. These are installed and not shipped loose.

6. Variable Frequency Drives: Where VFD's provided are non-standard equipment, supply one spare VFD preprogrammed for immediate replacement for each type and size included.

1.10 DELIVERY, STORAGE, AND HANDLING

A. If stored in space that is not permanently enclosed and air conditioned, remove loose packing and flammable materials from inside controllers and install temporary electric heating in accordance with manufacturers requirements.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for VFDs, including clearances between VFDs, and adjacent surfaces and other items. Suppliers unable to meet the maximum dimensions shown in the project drawings will be rejected unless specifically approved by the ENGINEER and the OWNER.

1.11 WARRANTY

A. Special Warranty: A 6-year on-site warranty shall be provided such that the OWNER is not responsible for any warranty costs including travel, labor, parts, or other costs for a full 6 years from the date of manufacture of the Drive. The warranty shall cover all drive failures including line anomalies – including lightning strikes, load anomalies, accidental exposure to moisture or corrosives and accidental collision of other physical damage; product misapplications, vandalism and chronic problems due to the misapplication are not covered. The cost of the warranty shall be included in the bid.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following

1. ABB ACQ580

2. Or Engineer approved equal.

B. VFD shall utilize Ethernet communication protocol.

2.02 SYSTEM DESCIPTION

A. General Requirements for VFDs:

1. VFDs and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2. Comply with NEMA ICS 7, NEMA ICS 61800-2, UL 409 and UL 508A.

B. Application: VFDs shall be variable torque unless otherwise indicated on the drawings.

C. VFD Description: Variable-frequency motor controller, consisting of power converter that employs pulse-width-modulated inverter, factory built and tested in an enclosure, with integral disconnecting means and overcurrent and overload protection; listed and labeled by an NRTL as a complete unit; arranged to provide self-protection, protection, and variable-speed control of one or more three-phase induction motors by adjusting output voltage and frequency.

1. Units suitable for operation of inverter-duty rated motors as defined by NEMA MG 1.

2. Listed and labeled for integrated short-circuit current (withstand) rating by an NRTL acceptable to authorities having jurisdiction.

D. Design and Rating: Match load type, such as fans, blowers, and pumps; and type of connection used between motor and load such as direct or through a power-transmission connection.

E. Output Rating:

1. Variable Torque: Three phase; 10 to 60 Hz, with voltage proportional to frequency throughout voltage range; maximum voltage equals input voltage.

F. Unit Operating Requirements:

1. Input AC Voltage Tolerance: Plus 10 and minus 10 percent of VFD input voltage rating.
2. Input AC Voltage Unbalance: Not exceeding 5 percent.
3. Input Frequency Tolerance: Plus or minus 3 percent of VFD frequency rating.
4. Minimum Efficiency: 97 percent at 60 Hz, full load.
5. Minimum Displacement Primary-Side Power Factor: 96 percent under any load or speed condition.
6. Minimum Short-Circuit Current (Withstand) Rating: to match the AIC of the servicing over current device.
7. Ambient Temperature Rating: Not less than 14 deg F (-10 deg C) and not exceeding 122 deg F (50 deg C).
8. Humidity Rating: Less than 95 percent (noncondensing).
9. Altitude Rating: Not exceeding 3300 feet (1000 m).
10. Vibration Withstand: Comply with NEMA ICS 61800-2.
11. Overload Capability: 1.1 (variable torque) or 1.5 (constant torque) times the base load current for 60 seconds; minimum of 1.8 times the base load current for three seconds.
12. Starting Torque: Minimum 100 percent of rated torque from 3 to 60 Hz.
13. Speed Regulation: Plus or minus 5 percent.
14. Output Carrier Frequency: Selectable; 0.5 to 15 kHz.
15. Stop Modes: Programmable; includes fast, free-wheel, and dc injection braking.

G. Inverter Logic: Microprocessor based, 16 bit, isolated from all power circuits.

H. Isolated Control Interface: Allows VFDs to follow remote-control signal over a minimum 40:1 speed range.

1. Signal: Electrical

I. Internal Adjustability Capabilities:

1. Minimum Speed: 5 to 50 percent of maximum rpm.
2. Maximum Speed: 80 to 100 percent of maximum rpm.

3. Acceleration: 0.1 to 999.9seconds.
4. Deceleration: 0.1 to 999.9 seconds.
5. Current Limit: 50 to minimum of 110 percent of maximum rating.

J. Self-Protection and Reliability Features:

1. Surge Suppression: VFD shall have input surge protection utilizing MOV's, spark gaps, and Zener diodes to withstand surges of 2.3 times line voltage for 1.5 msec. Field or Factory mounted surge suppressors shall meet or exceed UL 1449 SPD, Type 2. Comply with "16289 - Low Voltage Surge Protection."
2. Loss of Input Signal Protection: Selectable response strategy, including speed default to a percent of the most recent speed, a preset speed, or stop; with alarm.
3. Under and overvoltage trips.
4. Inverter overcurrent trips.
5. VFD and Motor-Overload/Overtemperature Protection: Microprocessor-based thermal protection system for monitoring VFDs and motor thermal characteristics, and for providing VFD overtemperature and motor-overload alarm and trip; settings selectable via the keypad.
6. Critical frequency rejection, with three selectable, adjustable deadbands.
7. Instantaneous line-to-line and line-to-ground overcurrent trips.
8. Loss-of-phase protection.
9. Reverse-phase protection.
10. Short-circuit protection.
11. The VFD shall have four programmable "Bypass frequencies" with adjustable bandwidths to prevent the driven equipment from running at a mechanically resonant frequency

K. Automatic Reset/Restart: The drive shall be configured such that it automatically resets on return of power after a power loss. In addition, the drive shall be configured for manual reset of faults from the fault reset pushbutton or remotely from the control system.

L. Power-Interruption Protection: To prevent motor from re-energizing after a power interruption until motor has stopped, unless "Bidirectional Autospeed Search" feature is available and engaged.

M. Bidirectional Autospeed Search: Capable of starting VFD into rotating loads spinning in either direction and returning motor to set speed in proper direction, without causing damage to drive, motor, or load.

N. Torque Boost: Automatically varies starting and continuous torque to at least 1.5 times the minimum torque to ensure high-starting torque and increased torque at slow speeds.

O. Motor Temperature Compensation at Slow Speeds: Adjustable current fall-back based on output frequency for temperature protection of self-cooled, fan-ventilated motors at slow speeds.

P. Integral Input Disconnecting Means and OCPD: UL 489, molded-case switch, with power fuse block and current-limiting fuses with pad-lockable, door-mounted handle mechanism.

1. Disconnect Rating: Not less than 125 percent of NFPA 70 motor full-load current rating or VFD input current rating, whichever is larger.
2. Auxiliary contacts "a" and "b" arranged to activate with circuit-breaker handle.
3. NC alarm contact that operates only when circuit breaker has tripped.

Q. Line and load cable terminations: Provide quantity and size of lugs as required to accommodate design cabling as seen in the conduit and conductor schedule.

R. Printed Circuit boards shall be conformal coated to reduce the corrosion effect from environmental gases and other conditions. The conformal coating must meet IEC 61721-3-3, Class 3C2

2.03 CONTROLS AND INDICATION

A. Status Lights: Door-mounted LED indicators displaying the following conditions (lights to have a push to test function):

1. Run (Red).
2. Stop (Green)
3. Fault (Amber)
4. Control Power Available (White)

B. Panel-Mounted Operator Station: Manufacturer's standard front-accessible, sealed keypad and plain-English-language digital display; allows complete programming, program copying, operating, monitoring, and diagnostic capability.

1. VFD shall provide an alphanumeric backlit display keypad (LCP) which may be remotely mounted using a standard 9-pin cable. VFD may be operated with keypad disconnected or removed entirely. Keypad may be disconnected during normal operation without the need to stop the motor or disconnect power to the VFD.
2. VFD Keypad shall feature an INFO key that, when pressed, shall display the contents of the programming manual for the parameter that is currently viewed on the display. The description shall explain the feature and how the settings can be made by the operator.
3. VFD shall display all faults in plain text; VFD’s which can display only fault codes are not acceptable.
4. The keypad shall feature a 6-line graphical display and be capable of digitally displaying up to five separate operational parameters or status values simultaneously (including process values with the appropriate engineering unit) in addition to Hand/Off/Auto, Local/Remote, and operating status.

5. Keypad shall provide an integral H-O-A (Hand-Off-Auto) and Local-Remote selection capability, and manual control of speed locally without the need for adding selector switches, potentiometers, or other devices.
6. VFD keypad shall be capable of storing drive parameter values in non-volatile RAM uploaded to it from the VFD, and shall be capable of downloading stored values to the VFD to facilitate programming of multiple drives in similar applications, or as a means of backing up the programmed parameters.
7. VFD Display shall have the ability to display 5 different parameters pertaining to the VFD or the load including: current, speed, DC bus voltage, output voltage, input signal in mA, or other values from a list of 92 different user-selectable parameters.
8. VFD display shall indicate which digital inputs are active and the status of each relay.
9. VFD display shall indicate the value of any voltage or current signal, including the engineering units of measurement, connected to the analog input terminals.
10. VFD display shall indicate the value of the current at the analog output terminals, including the engineering units of measurement.
11. Two-level password protection shall be provided to prevent unauthorized changes to the programming of the VFD. The parameters can be locked via a digital input and/or the unit can be programmed not to allow an unauthorized user to change the parameter settings.
12. A digital elapsed time meter and kilowatt hour meter shall be provided in the display.
13. The VFD shall store in memory the last 10 faults with time stamp and recorded data.

C. Provide a HAND –OFF – AUTO selector switch for each VFD.

D. Provide RESET pushbutton for each VFD.

E. Historical Logging Information and Displays:

1. Total run time.
2. Fault log, maintaining last ten faults with time and date stamp for each.

F. Control Signal Interfaces:

1. Electric Input Signal Interface:

   a. A minimum of two programmable analog inputs: 4 - 20-mA
   b. A minimum of six multifunction programmable digital inputs.

2. Output Signal Interface: A minimum of two programmable analog output signals 4 – 20 mA, which can be configured for any of the following:

   a. Output frequency (Hz)
   b. Output speed.

3. Remote Indication Interface: A minimum of two programmable dry-circuit relay outputs (120-V ac, 1 A) for remote indication of the following:

a. Auto status
b. Hand status
c. Run status
d. Remote stop
e. Fault and warning indication (overtemperature, overcurrent, motor thermal overload, or other system fault)

G. Facility Control System Interface: Factory-installed hardware and software shall interface with Facility Control System to monitor, control, display, and record data for use in processing reports. VFD settings shall be retained within VFD's nonvolatile memory.

1. Communication Interface: Comply with Ethernet.
2. The VFD control board must have the functionality to be energized with 24Vdc External source to maintain active the Communication and VFD control board when three (3) phase power of VFD goes out.
3. Communications interface connection shall be certified by Ethernet International.

2.04 LINE CONDITIONING AND FILTERING

A. LINE CONDITIONING

1. Input Line Conditioning: Based on the manufacturer's harmonic analysis study and report, provide input filtering and active harmonic correction, as required, to limit total harmonic distortion at the defined Point of Common Coupling (PCC) to meet IEEE 519 recommendations. Harmonic study shall define the PCC at the primary terminals of the main facility service transformer.
2. The VFD shall provide internal DC link reactors to minimize power line harmonics and to provide near unity power factor. DC Link reactor shall be installed so that power fluctuations to the DC Capacitors shall be reduced to increase Capacitor life. VFD’s without a DC link reactor shall provide a 5% impedance line side reactor and provide spare capacitors

B. Output filtering: Provide output filtering per the VFD manufacturer’s recommendations based on the motor lead lengths. Output filtering is required on all motor leads greater than 150 ft.

2.05 OPTIONAL FEATURES

A. Motor Heater Contact and CPT: Provide a motor space heater contact and a CPT sized to provide power for the motor heater when the VFD is offline.

B. Remote Indicating Circuit Terminals: Mode selection, controller status, and controller fault.

C. Remote digital operator kit, located on the exterior of the drive enclosure

D. Communication Port: Ethernet.

2.06 ENCLOSURES

A. VFD Enclosures: NEMA 250, to comply with environmental conditions at installed location.

1. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: Type 12.

2.07 ACCESSORIES

A. General Requirements for Control-Circuit and Pilot Devices: NEMA ICS 5; factory installed in VFD enclosure cover unless otherwise indicated.

1. Push Buttons: Unguarded.
2. Pilot Lights: Push to test, and LED
3. All pilot devices to be 30 mm, heavy duty, oil tight (housing to match VFD enclosure)
4. Selector Switches: Rotary type.
5. Stop and Lockout Push-Button Station: Momentary-break, push-button station with a factory-applied has arranged so padlock can be used to lock push button in depressed position with control circuit open.

B. Cooling Fan and Exhaust System: For NEMA 250, NEMA 1 UL 508 component recognized: Supply fan, with intake and exhaust grills and filters 120 -V ac, power from integral CPT. (Provide thermostat control and interlock with drive operation).

C. Spare control-wiring terminal blocks; wired.

2.08 SOURCE QUALITY CONTROL

A. Testing: Test and inspect VFDs according to requirements in NEMA ICS 61800-2.

1. Test each VFD while connected to its specified motor
2. Verification of Performance: Rate VFDs according to operation of functions and features specified.

B. VFDs will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine areas, surfaces, and substrates to receive VFDs, with Installer present, for compliance with requirements for installation tolerances, and other conditions affecting performance of the Work.

B. Examine VFD before installation. Reject VFDs that are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for conduit systems to verify actual locations of conduit connections before VFD installation.

D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Wall-Mounting Controllers: Install with tops at uniform height and with disconnect operating handles not higher than 79 inches (2000 mm) above finished floor, unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not on walls, provide freestanding racks complying with Section 16071 Hangers and Supports.

B. Floor-Mounting Controllers: Install VFDs per Manufacturer's instructions and requirements.

1. For supported equipment, install anchor bolts that extend through base and anchor into structural floor.

2. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items.

3. Install anchor bolts to elevations required for proper attachment to supported equipment.

C. Roof-Mounting Controllers: Install VFD on roofs with tops at uniform height and with disconnect operating handles not higher than 79 inches (2000 mm) above finished roof surface unless otherwise indicated, and by bolting units to curbs or mounting on freestanding, lightweight, structural-steel channels bolted to curbs. Seal roof penetrations after raceways are installed.

1. Structural-steel channels are specified in Section 16071 Hangers and Supports.

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

E. Install fuses in each fusible-switch VFD.

F. Install heaters in thermal-overload relays. Select heaters based on actual nameplate full-load amperes after motors are installed.

G. Install, connect, and fuse thermal-protector monitoring relays furnished with motor-driven equipment.

H. Comply with NECA 1.

3.03 CONTROL WIRING INSTALLATION

A. Install wiring between VFDs and remote devices and facility's control system. Comply with requirements in Section 16120 Low Voltage Electrical Power Conductors and Section 16710 Communications Cabling.

B. Bundle, train, and support wiring in enclosures.

C. Connect selector switches and other automatic-control devices where applicable.

1. Connect selector switches to bypass only those manual- and automatic-control devices that have no safety functions when switches are in manual-control position.

2. Connect selector switches with control circuit in both manual and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor-overload protectors.

3.04 IDENTIFICATION

A. Identify VFDs, components, and control wiring. Comply with requirements for identification specified in Section 16075 "Identification for Electrical Systems".

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each VFD with engraved nameplate.
3. Label each enclosure-mounted control and pilot device.

B. Operating Instructions: Frame printed operating instructions for VFDs, including control sequences and emergency procedures. Fabricate frame of finished metal, and cover instructions with clear acrylic plastic. Mount on front of VFD units.

3.05 FIELD QUALITY CONTROL

A. Factory acceptance testing shall be required for suppliers who choose to fabricate the enclosed VFD control panel and install a manufacturers VFD within the control panel to ensure that the provided control panel meets the requirements of the project documents. FAT testing shall be in accordance with the Section 16991 Factory Acceptance Testing.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each VFD element, bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Inspect VFD, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.
2. Test insulation resistance for each VFD element, component, connecting motor supply, feeder, and control circuits.
3. Test continuity of each circuit.
4. Verify that voltages at VFD locations are within 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify ENGINEER before starting the motor(s).
5. Test each motor for proper phase rotation.
6. Perform tests according to the Inspection and Test Procedures for Adjustable Speed Drives stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
8. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. VFDs will be considered defective if they do not pass tests and inspections.

E. Perform Harmonic Distortion Testing at the point of common coupling defined in this specification and verify compliance with IEEE 519 guidelines.

F. Prepare test and inspection reports, including a certified report that identifies the VFD and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations made after remedial action.

3.06 STARTUP SERVICE

A. Perform startup service - Complete installation and startup checks according to manufacturer's written instructions.

B. Factory authorized service technician shall perform start-up on each drive. ("Start up" shall not include installation or termination of either power or control wiring.) The service technician shall perform start-up on up to 8 drives per day. Start-up costs provided with the bid shall include time and travel for the estimated number of visits required, but shall not be less than at least one half-day with travel. Additional labor or return trips to the site shall be billed at the manufacturer’s published straight-time rates. Upon completion, a start up service report shall be provided.

3.07 ADJUSTING

A. Program microprocessors for required operational sequences, status indications, alarms, event recording, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.

B. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and overload-relay pickup and trip ranges.

C. Set field-adjustable circuit-breaker trip ranges as specified in Section 16055 Power Systems Studies

D. VFD internal programming:

1. The VFD’s shall limit current delivered to each motor, such that the VFD full load amp (VFD FLA) rating of each motor is never exceeded, regardless of the motor speed called by the PLC or manual operation.

2. Motor starting shall be controlled on a two-slope setting, to enable the motor to come to speed quickly, yet minimize transient surge conditions in the distribution system. Slope 1 (50 HZ and below) = 3.0 HZ/sec (0 to 50 HZ within 17 seconds). Slope 2 = 0.333 HZ/sec (50 to 60 HZ within 30 seconds).

3. Motor stopping shall be controlled on a two-slope setting, to enable the motor to come to stop quickly, yet minimize transient surge conditions in the distribution system. Slope 1 (50 HZ and above) = 0.5 HZ/sec (60 to 50 HZ within 20 seconds). Slope 2, 3.0 HZ/sec (50 to 0 HZ within 17 seconds).

3.08 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions until controllers are ready to be energized and placed into service.

B. Replace VFDs whose interiors have been exposed to water or other liquids prior to Substantial Completion.

3.09 DEMONSTRATION

A. CONTRACTOR shall engage a factory-authorized service representative to train OWNER's maintenance personnel to adjust, operate, and maintain VFD's, overcurrent protective devices, instrumentation, and accessories, and to use and reprogram microprocessor-based trip, monitoring, and communication units.

END OF SECTION 16495

SECTION 16515

LIGHTING

PART 1 – GENERAL

1.01 SCOPE

A. Work described in this Section includes furnishing all labor, materials, equip¬ment, tools and incidentals required for a complete and operable installation of lighting fixtures, including luminaires and accessories, lamps and ballasts. All fixtures shall be installed, adjusted, tested and placed in operation in accordance with these Specifications, the manufacturer's recommendations and as shown on the Drawings.

B. Contract drawings show only functional features and some of the required exter¬nal connections. They do not show all components required for a complete installation nor exact dimensions particular to any manufacturer's equipment. Contractor shall supply all parts, devices and equipment necessary to meet the requirements of the Contract Documents and shall make all dimensional adjust¬ments particular to the equipment being furnished. All costs associated with such changes and adjustments shall be considered as being included in the price bid for the work shown and specified.

1.02 SUBMITTALS

A. Submittals shall be made in accordance with the requirements of the General Conditions of the Contract Documents.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Lithonia Lighting
2. Holophane
3. LSI Industries
4. Or ENGINEER APPROVED equal.

2.02 LUMINAIRES AND ACCESSORIES

A. Provide fixtures as shown in the Lighting Fixture Schedule on the Contract Drawings.

B. Provide fixture housings and frames to match the ceilings called for on the architectural drawings.

C. Provide a conduit back pan for surface mounted fixtures, wall, or ceiling, where surface mounted conduit is used.

D. LED Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5A.

2.03 LED LIGHTING FIXTURES

A. General:

1. LED light fixtures shall be in accordance with IES, NFPA, UL, as shown on the drawings, and as specified.
2. LED drivers shall include the following features unless otherwise indicated:
    a. Minimum efficiency: 85% at full load.
    b. Minimum Operating Ambient Temperature: -20˚ C. (-4˚ F.)
    c. Input Voltage: 120 - 277V (±10%) at 60 Hz.
    d. Integral short circuit, open circuit, and overload protection.
    e. Power Factor: ≥ 0.90.
    f. Total Harmonic Distortion: ≤ 20%.
    g. Comply with FCC 47 CFR Part 15.
3. LED modules shall include the following features unless otherwise indicated:
    a. Comply with IES LM-79 and LM-80 requirements.
    b. Minimum CRI 80 and color temperature 4000˚ K unless otherwise specified in LIGHTING FIXTURE SCHEDULE.
    c. Minimum Rated Life: 50,000 hours per IES L70.
    d. Light output lumens as indicated in the LIGHTING FIXTURE SCHEDULE.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install lamps in luminaries and lamp holders.

3.02 RELAMPING

A. Re-lamp all burned out lamps upon completion of work.

3.03 ADJUSTING AND CLEANING

A. Clean lenses and diffusers at completion of Work. Clean paint splatters, dirt, and debris from installed luminaires.

B. Touch up luminaire at completion of work to present an out of the box new appearance.

C. Mount continuous rows of luminaires in straight line. Utilize alignment clips between reflectors, where applicable.

END OF SECTION 16511

SECTION 16670

LIGHTNING PROTECTION FOR STRUCTURES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including EJCDC General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes lightning protection for existing ground storage tank No. 1, proposed ground storage tank No. 2, and the existing high service pump building.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For air terminals and mounting accessories.

1. Layout of the lightning protection system, along with details of the components to be used in the installation.

2. Include indications for use of raceway, data on how concealment requirements will be met, and calculations required by NFPA 780 for bonding of grounded and isolated metal bodies.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and manufacturer. Include data on listing or certification by UL.

B. Provide a certification, from the manufacturer of all roofing systems that the mounting method is approved by manufacturer of roofing material.

C. Field quality-control reports.

D. Comply with recommendations in NFPA 780, Annex D, "Inspection and Maintenance of Lightning Protection Systems," for maintenance of the lightning protection system.

E. Other Informational Submittals: Plans showing dimensioned as-built locations of grounding features, including the following:

1. Ground rods.

2. Ground loop conductor.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Certified by UL or LPI as a Master Installer/Designer, trained and approved for installation of units required for this Project.

B. System Certificate:

1. UL Master Label.

2. LPI System Certificate.

3. Provide a Recertification for any existing lighting protections system that the proposed system connects to.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 780, "Definitions" Article.

1.06 COORDINATION

A. Coordinate installation of lightning protection with installation of other building systems and components, including electrical wiring, supporting structures and building materials, metal bodies requiring bonding to lightning protection components, and building finishes.

B. Coordinate installation of air terminals attached to roof systems with roofing manufacturer and Installer. Flashings of through-roof assemblies shall comply with roofing manufacturers' specifications.

1.07 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to replace or replace SPDs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: One year from date of Substantial Completion.

PART 2 – PRODUCTS

2.01 LIGHTNING PROTECTION SYSTEM COMPONENTS

A. Comply with UL 96 and NFPA 780.

B. Roof-Mounted Air Terminals: NFPA 780, Class I or Class II depending on building height, aluminum unless otherwise indicated.

1. Basis-of-Design Product: Subject to compliance with requirements, or comparable product by one of the following:

a. East Coast Lightning Equipment Inc.
b. ERICO International Corporation.
c. Harger.
d. Heary Bros. Lightning Protection Co. Inc.
e. Independent Protection Co.
f. Preferred Lightning Protection.
g. Robbins Lightning, Inc.
h. Thompson Lightning Protection, Inc.
i. or Approved Equal

2. Air Terminals More than 24 Inches (600 mm) Long: With brace attached to the terminal at not less than half the height of the terminal.

3. Single-Membrane, Roof-Mounted Air Terminals: Designed specifically for single-membrane roof system materials. Comply with requirements in roofing Sections.

C. Main and Bonding Conductors: Aluminum.

D. Ground Loop Conductor: The same size and type as the main conductor except tinned.

E. Ground Rods: Copper-clad steel, sectional type; ¾-inch (19 mm) in diameter by 10 feet (3 m) long.

F. Heavy-Duty, Stack-Mounted, Lightning Protection Components: Stainless steel.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install lightning protection components and systems according to UL 96A and NFPA 780

B. Install conductors with direct paths from air terminals to ground connections. Avoid sharp bends.

C. Conceal the following conductors:

1. System conductors.
2. Down conductors.
3. Interior conductors.
4. Conductors within normal view of exterior locations at grade within 200 feet (60 m) of building.

D. Cable Connections: Use crimped or bolted connections for all conductor splices and connections between conductors and other components. Use dissimilar metal connectors (i.e. copper to aluminum) as applicable.

E. Cable Connections: Use exothermic-welded connections in underground portions of the system.

F. Air Terminals on Single-Ply Membrane Roofing: Comply with roofing membrane and adhesive manufacturer's written instructions.

G. Bond lightning protection components with intermediate-level interconnection loop conductors to grounded metal bodies of building at 60-foot (18-m) intervals.

H. Install a bond jumper between the building ground and the lighting protection Ground Loop. The bond jumper shall be a #4/0 awg.

3.02 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 16131 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.03 CORROSION PROTECTION

A. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture unless moisture is permanently excluded from junction of such materials. Utilize manufacturer provided connectors for dissimilar metals.

B. Use factory fabricated bi-metallic cable connectors for dissimilar metals such as aluminum / copper connector similar to Erico part number LPA598.

C. Use conductors with protective coatings where conditions cause deterioration or corrosion of conductors.

3.04 FIELD QUALITY CONTROL

A. Notify ENGINEER at least 48 hours in advance of inspection before concealing lightning protection components.

B. Obtain one of the following labels:

1. UL Inspection: Meet requirements to obtain a UL Master Label for system.

2. LPI System Inspection: Meet requirements to obtain an LPI System Certificate.

END OF SECTION 16670

SECTION 16710

COMMUNICATIONS CABLING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Specifications for instrumentation cables

B. Specifications for ethernet cables

C. Specification for optical fiber cables.

1.03 CITED STANDARDS

A. National Fire Protection Association (NFPA):

1. 70, National Electrical Code (NEC).
2. 70E Standard for Electrical Safety in the Workplace 2012.

B. The Institute of Electrical and Electronics Engineers (IEEE).

C. International Society of Automation (ISA).

D. Telecommunications Industry Association (TIA).

E. Underwriters Laboratory (UL).

F. Insulated Cable Engineers Association (ICEA).

1.04 QUALITY CONTROL

A. The CONTRACTOR shall inspect all materials in the field for compliance with Contract requirements prior to compliance testing with the ENGINEER.

B. The CONTRACTOR shall demonstrate, to the satisfaction of the Owner's ENGINEER, that materials meet the intent of the Contract Documents.

C. The Integrator shall remove or replace any materials or programming that do not comply with the Contract Documents.

D. All test equipment shall be calibrated in accordance with the manufacturer's written documentation. The CONTRACTOR shall provide acceptable proof of calibration with all test reports.

1.05 ACTION SUBMITTALS

A. Submit in accordance with Section 01300:

1. Product data: for each type of product.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Field quality-control reports.

C. Standard Test Record Sheets.

1.07 ABBREVIATIONS

A. BICSI: Building Industry Consulting Service International.

B. EMI: Electromagnetic interference.

C. IDC: Insulation displacement connector.

D. LAN: Local area network.

E. RCDD: Registered Communications Distribution Designer.

PART 2 – PRODUCTS

2.01 GENERAL

A. Furnish network media products as indicated in the contract drawings and specifications.

B. All products shall meet all requirements stated in this specification.

2.02 INSTRUMENTATION CABLE

A. Manufacturers:

1. Southwire
2. Belden
3. Mouser Electronics, Inc.
4. Pepperl + Fuchs, Inc.
5. Or Engineer Approved Equal. All request for substitutions shall be submitted with complete and thorough documentation of equivalency and submitted for approval no less than two weeks prior to bidding.

B. Flame Rating: LSZH

C. Analog Control Cable

1. Analog signal cable (4-20 mA) shall be 18-gauge twisted shielded single pair tinned copper stranded conductors.
2. The pair shall have a minimum lay of 2 inches per twist.
3. The shield shall be aluminum-polyester with a 20 AWG stranded tinned copper drain wire and an overall Teflon jacket rated at 300 volts.
4. Color code shall be red and black.
5. Cable shall be suitable for plenum, conduit and submerged service.
6. Shields shall be properly grounded at each end.

D. Discrete Signal Wire

1. Soft drawn copper conforming to ASTM Standard B-3.
2. All wire shall be single conductor type unless otherwise indicated.
3. All wire shall be stranded in accordance with ASTM Standard B-8.
4. Instrumentation discrete signal wire shall be a minimum of #14 AWG.
5. Wiring within the panels shall be a minimum of #16 AWG.

2.03 ETHERNET COMMUNICATION

A. Manufacturers:
   1. Belden
   2. Southwire
   3. Mouser Electronics, Inc.
   4. Pepperl + Fuchs, Inc.
   5. Or Engineer Approved Equal. All request for substitutions shall be submitted with complete and thorough documentation of equivalency and submitted for approval no less than two weeks prior to bidding.

B. Description: CAT 6, 22awg, UTP (unshielded twisted pair) manufactured in accordance ANSI/TIA/EIA-568-B.2 and ANSI/ICEA S-80-576

C. Ethernet network isolators are required on all ethernet networks.

2.04 OPTICAL FIBER CABLE

A. Manufacturers:
   1. Mouser Electronics, Inc.
   2. Pepperl + Fuchs, Inc.
   3. Belden
   4. OFS
   5. Corning
   6. Or Engineer Approved Equal. All request for substitutions shall be submitted with complete and thorough documentation of equivalency and submitted for approval no less than two weeks prior to bidding.

B. Description: Single mode, 8.3/125 micrometer (OS2), 12 count , nonconductive, tight buffer, optical fiber cable.
   1. Comply with ICEA S-83-596 for mechanical properties.
   2. Comply with TIA/EIA-568-B.3 for performance specifications.
   3. Comply with TIA-492AAAA-A for detailed specifications.
   4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:
   5. General Purpose, Nonconductive: Type OFN or OFNG

6. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.
7. Riser Rated, Nonconductive: Type OFNR or OFNP, complying with UL 1666.
8. Maximum Attenuation: 3.50 dB/km at 850 nm; 1.5 dB/km at 1300 nm.
9. Minimum Modal Bandwidth: 160 MHz-km at 850 nm; 500 MHz-km at 1300 nm.

C. Jacket:
1. Jacket Color:
a. Yellow for 8.3/125-micrometer cable.
2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-C.
3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches (1000 mm).

D. Fiber optic connectors shall be ST type unless otherwise noted.

PART 3 – EXECUTION

3.01 GENERAL

A. Provide all labor, materials, field-test instruments and equipment required to complete the installation, testing and commissioning of the required Network Media in accordance with the contract documents.

B. In order to conform to the overall project schedule, the CONTRACTOR shall survey the work area and coordinate cable testing with the other applicable trades.

END OF SECTION 16710

SECTION 16900

CONTROL SYSTEMS INTEGRATOR

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Requirements for the CONTRACTOR to provide a Control System Integrator (CSI) who shall be responsible for integrating the existing and proposed equipment, material, and software into a fully operational control system.

B. Requirements specific to the CSI and specific integration work associated with the contract plans and specifications.

C. CSI shall be responsible for the coordination, supply, and testing of the following:

1. Section 16910 “Control Panel Construction”
2. Section 16930 “Functional Control Description”
3. Section 16950 “Field Instruments”

1.03 CITED STANDARDS

A. National Fire Protection Association (NFPA):

1. 70, National Electrical Code (NEC)
2. 70E Standard for Electrical Safety in the Workplace

B. The Institute of Electrical and Electronics Engineers (IEEE)

C. International Society of Automation (ISA)

1.04 INTRODUCTION

A. The Control System Integrator may also be referred in this contract as the Integrator or the CSI.

B. The CSI shall be responsible for supplying the control systems equipment and communication capability detailed in contract documents. Equipment shall include instrumentation, PLC, OIT, control panels, panel wiring, interconnections between panels, panel devices and communications equipment. The responsibilities of the CSI shall also include programming services and software development for PLC, OIT, and communication systems. Additionally, the CSI shall provide detailed designs, testing, validation, quality assurance/quality control, calibrations, settings, control systems maintenance, and training as associated and required within the scope of work.

1.05 OVERVIEW OF INTEGRATOR’S SCOPE

A. The intent of the work shall be in accordance with the contract drawings, specifications, terms of reference, applicable codes, existing documents, and any applicable listings.

B. The control system shall include but not be limited to: monitoring, control, data acquisition, communications, and networking.

C. The Integrator's scope of work is to include but not necessarily be limited to:

1. Perform discovery work as required for implementing further detailed design to meet the requirements detailed herein.
2. Supply and install of materials and equipment.
3. Provide detailed design as described.
4. Coordinate activities with other divisions to ensure complete and fully operational systems are provided.
5. Coordinate with manufacturers as applicable to interface with manufacturer's panels.
6. Provide new control panels in accordance with Contract Drawings and Specifications.
7. Ensure all devices and components are set, tested, and calibrated for proper operation.
8. Develop new software applications for PLC control logic as described in the Contract Documents.
9. Develop graphic displays in the OIT for booster pump station control process.
10. Provide drawings and submittal documents as listed in this Section.
11. Perform factory acceptance testing (FAT), commissioning, and site acceptance testing (SAT) for control systems.
12. Schedule and provide operator training.

D. The Integrator shall provide a detailed design of the control panels.

E. The Integrator shall subcontract McKim & Creed program development and deployment of the PLC control logic elements defined in the contract documents.

F. The Integrator shall include an additional 160 manhours in their price as an allowance for programming as directed by the ENGINEER in the field. This will only be used as directed by the ENGINEER.

G. The Integrator shall install and configure communication equipment.

H. The Integrator shall be required to meet minimum qualification levels as defined herein.

I. The Integrator shall assume responsibility and maintain equipment identified for upgrade or replacement in the Contract Plans and Specifications during the project period.

J. The Integrator shall adhere to national and local code requirements for installation and commissioning.

K. The CONTRACTOR and CSI are required to install all wiring, piping, conduits and necessary mounting hardware and accessory equipment to provide a complete and fully operational control system as indicated in the Contract Plans and Specifications.

1.06 SPECIAL PROJECT PROCEDURES

A. The Integrator is to consider the following special conditions that apply in addition to conventional project procedures as follows:

1. The Integrator must ensure protection of the existing operating controls during construction by properly backing up the existing system prior to construction if restoration is required.
2. Access is limited to typical business hours (8 AM to 5 PM) and access beyond normal business hours must be coordinated with the OWNER.
3. The Integrator shall protect all supplied equipment against damages and replace any failures during the entire project period.

1.07 QUALITY CONTROL

A. The CSI, working under the direction of the CONTRACTOR, shall implement quality assurance and control measures to include the following:

1. Factory Acceptance Test (FAT) procedures.
    a. The Factory Acceptance Test (FAT) shall allow the Integrator to demonstrate simulated operation and functionality of the control system to the OWNER and ENGINEER prior to delivery and installation. Notify OWNER and ENGINEER two weeks in advance to allow for attendance during FAT testing.
    b. The Integrator shall provide all hardware and software for simulation.
2. Installation and Commissioning Procedures
    a. The Integrator shall follow installation and commissioning Procedures to reduce risk and to safeguard personnel and equipment during installation.
    b. These procedures shall be conducted in accordance with Section 16992.
3. Site Acceptance Test (SAT) procedures.
    a. The SAT shall allow the Integrator to demonstrate and document proper operational readiness and functionality of the control system, to the OWNER and ENGINEER after installation and on-site I/O checkout.
    b. Include site system integration into Owner’s overall control system and verify functionality within Owner’s remote operations system.
    c. The SAT shall be conducted in accordance with Section 16993.

B. To ensure quality, all components shall be UL listed or certified by an approved NRTL.

1.08 SUBMITTALS

A. Provide all submittals in accordance with The Project Manual

B. Shop Drawings and Product Data

1. As part of the requirements of this section of the specifications, the CONTRACTOR shall provide shop drawings and descriptive literature of the control system package for the ENGINEER's review. No fabrication, programming, or installation of any control system equipment shall take place without such review. No partial shop drawing submittals will be accepted.

2. Shop drawings for the control system shall be submitted in accordance with the requirements of the general requirements of these specifications. Shop drawings for the control system shall include, as a minimum, the following:
    a. Elementary wiring diagrams and panel elevations for control panels.
    b. Control schematics for equipment.
    c. Interconnection wiring diagrams detailing wiring or cabling to the field devices, sensors, or instruments as well as network or other communication cables necessary for integration.
    d. Manufacturer’s Data Sheets with complete model numbers and any applicable manufacturer’s recommended practices for the equipment.
    e. Software data sheets. Complete software descriptions and version numbers shall be provided for review and approval.
    f. Diagram of the control system communication architecture. The diagram shall show all hardware and communication components.
    g. Screenshots or diagrams of all proposed graphic display screens for the OIT.
    h. Loop Diagrams for all field devices.

C. Integration services to design, program, install, commission, and test the booster pump station control system, sodium hypochlorite storage and communication configuration for remote access to monitoring data.

D. Final Documentation

1. Shop Drawings and Product Data:

2. As part of the requirements of this section of the specifications, the CONTRACTOR shall provide shop drawings and descriptive literature of the control system package for the ENGINEER's review. No fabrication, programming, or installation of any control system equipment shall take place without such review. No partial shop drawing submittals will be accepted.

3. Shop drawings for the control system shall be submitted in accordance with the requirements of the General Requirements of these Specifications. Shop drawings for the control system shall include, as a minimum, the following:

4. Elementary wiring diagrams and panel elevations for control panels.

5. Control schematics for equipment.

6. Interconnection wiring diagrams detailing wiring or cabling to the field devices, sensors, or instruments as well as network or other communication cables necessary for integration.

7. Manufacturer’s data sheets with complete model numbers and any applicable manufacturer’s recommended practices for the equipment.

8. Software data sheets. Complete software descriptions and version numbers shall be provided for review and approval.

9. Diagram of the control system communication architecture. The diagram shall show all hardware and communication components.

10. Screenshots or diagrams of all proposed graphic display screens for the OIT.

11. Loop Diagrams for all field devices.

PART 2 – PRODUCTS

2.01 TRAINING

A. The CONTRACTOR shall provide familiarization training to the operations personnel after completion of the SAT. The CONTRACTOR shall coordinate with OWNER for availability of operators to schedule training.

B. The training shall consist of the following:

1. New equipment familiarization and troubleshooting.
2. OIT Training.
3. Trouble-shooting procedures.

2.02 WARRANTY FOR INTEGRATION SUPPORT

A. The warranty shall be one year from the date of substantial completion.

B. The warranty period shall provide the following:

1. Replacement of any newly installed equipment for 1 year.
2. Software and application programming support to correct any errors or omissions in control logic, graphic displays in the OIT, communication configuration for remote access.
3. A block of 40 hours of Integrator support time to be used at the OWNER's discretion to make enhancements or changes to the PLC or graphics.
    a. This block of time may be used in non-contiguous blocks of 4 hours.
    b. The time may only be used for offsite programming and remote support/ troubleshooting.
    c. Any unused time will expire after the 1-year warranty period.
    d. On-site time, direct expenses, or additional time must be coordinated and contracted separately from this contract between the OWNER and the Integrator.

PART 3 – EXECUTION

3.01 CONTROL SYSTEMS INTEGRATOR (CSI)

A. The Integrator shall:

1. Be responsible for integrating the existing and proposed equipment, material, and software into a fully operational control system.
2. Work directly for the CONTRACTOR involved with the installations.
3. Provide integration and supply of controls related hardware and software shown on the design drawings to include, but not limited to:
    a. PLC equipment.
    b. Control panel equipment.
    c. Cable and wiring for a complete functional control system.
    d. Variable Frequency Drives.

e. Communication equipment for wireless cellular communication.
f. Overseeing terminations and testing of wiring to PLC, I/O, sensors, control and monitoring panels, control elements, other systems interface, OIT and communications system.
g. Terminal boxes as required.
h. Required PLC and OIT application software.
i. Miscellaneous items required for a fully operational control system.

4. Provide and install all software development for this project. This software shall include but not be limited to the following:

   a. PLC application software
   b. PLC Control Logic application code
   c. OIT application software
   d. OIT graphic displays
   e. Reporting applications
   f. Database configurations
   g. Miscellaneous software as required to produce a fully operational control system.

5. Configuration of wireless cellular communication equipment.

6. Remote access configuration and written procedure for accessing data from remote location.

7. Provide record documentation as specified in Section 16900.

8. Provide training as specified in Section 16900.

3.02 CONTROL SYSTEM INTEGRATOR QUALIFICATIONS

A. Pre-approved Integrators are as follows:

   1. General Control Systems (GCS)

   2. Keltour

   3. Or SJCUD approved equal

B. PLC programming development and deployment shall be completed by McKim & Creed.

C. The Integrator’s staff shall meet the following requirements:

   1. Programmers:

      a. Lead Programmers shall be graduate engineers or computer science majors with a 4-year college degree.
      b. Team programmers shall have a minimum of a 2-year associate degree in a field related to computers or electrical maintenance.
      c. As a minimum, all programmers shall have a minimum of 10 years of experience in industrial PLC and HMI programming for water or wastewater systems.

   2. Field Service Technicians:

a. All service technicians shall have a minimum of a 2-year associate degree in a field related to computers or electrical maintenance.
b. All service technicians shall have a minimum of five years of experience in PLC systems and HMIs.
c. All service technicians shall be capable of programming minor edits in the project PLC's and uploading or downloading PLC applications.
d. All service technicians shall have experience troubleshooting: motor starters, PLC's, computers, HMI systems, and basic electrical controls.
e. Service technicians shall show proficiency in using the following equipment: volt meters, PLC programming software, HMI configuration tools.

END OF SECTION 16900

SECTION 16910

CONTROL PANEL CONSTRUCTION

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Requirements for the CONTRACTOR to furnish and install control panels referenced on the Contract Drawings and specified herein.

B. Control panel fabrication shall be performed by the Control System Integrator (CSI) or by a fabricator working as a direct subcontractor to the CSI to ensure the panels are constructed, tested, and delivered in accordance with the contract documents.

C. Control panels shown or described in the Contract documents are diagrammatic in nature and may not depict all required components necessary. This in no way limits the CONTRACTOR'S and CSI's responsibility to provide a complete and fully functional system as required to operate the facility according to Section 16930 of these specifications.

1.03 RELATED SECTIONS

A. Division 16

B. General and Special Provisions of the Contract.

1.04 REFERENCE STANDARDS

A. National Fire Protection Association (NFPA)

B. Occupational Safety & Health Administration (OSHA)

C. The Institute of Electrical and Electronics Engineers (IEEE)

D. International Society of Automation (ISA)

E. Building Industry Consulting Service International

F. Telecommunications Industry Association (TIA)

G. Underwriters' Laboratories, Inc. (UL)

H. National Electric Manufacturers Association (NEMA)

I. American National Standards Institute (ANSI)

1.05 NOTED RESTRICTIONS

A. The "Delegate" ENGINEER of Record for the Control System shall be responsible for the detailed design of all custom-built control panels based on the information contained in the drawings. In addition, the "Delegate" ENGINEER of Record for the

Control System shall be responsible for all interconnection and loop drawings associated with the custom-built control panels.

1.06 QUALITY CONTROL

A. The control panel components shall be of the most current and proven design. Specifications and Drawings call attention to certain features but do not purport to cover all details entering into the design of the control panels. The components provided by the Control Panel Builder shall be compatible with the functions required and shall form a complete working system.

B. The entire control system shall bear a UL 508A serialized label “Enclosed Industrial Control Panel”. The use of the label “Industrial Control Panel Enclosure” without the UL508A serialized label is not acceptable.

1.07 SUBMITTALS

A. Shop drawings shall include at a minimum the following:

1. Catalog information and descriptive literature of all components, wiring diagrams, and panel layout drawings showing dimensions to all devices.
2. Loop diagram and field wiring diagrams for each control panel.
3. Network installation drawings/schematics related to the panel.
4. Material test certifications and manufacturer’s material certifications.
5. Heat load calculations for equipment containing active electronic components.
6. Power supply load calculations
7. CONTRACTOR’s installation methods, equipment, materials, and product data.
8. Material Safety Data Sheets (MSDSs) for all materials to be used to meet the requirements of this section.

1.08 SPARE PARTS

A. Spare parts shall be furnished for each Control panel including but not limited to the following:

1. One (1) spare SD memory card for each type provided
2. One (1) spare I/O modules for each type provided
3. 10% spare fuses of each type provided but not less than two of each type.
4. 20% spare I/O within installed I/O modules by the panel fabricator
5. 10% spare terminal blocks (preinstalled by the control panel fabricator)
6. One (1) spare indicator light for each type provided
7. Spare parts shall be packaged individually in boxes that are clearly labeled with part name and manufacturer’s part/stock number.
8. Where indicated or requested by the OWNER, provide a lockable steel cabinet sized based on the spare parts provided plus 20% spare capacity for owner’s

use. Indoor conditioned space cabinets shall be NEMA 4X. Indoor unconditioned space cabinets shall be NEMA 4X.

1.09 WARRANTY

A. The CONTRACTOR shall provide a manufacturer's warranty covering the full replacement of all equipment specified within this section. All equipment supplied under this section shall be warranted for a period of one (1) year by the MANUFACTURER from substantial completion.

PART 2 – PRODUCTS

2.01 CONTROL PANEL

A. The completed control panel assembly shall be manufactured by the CSI or a qualified control panel builder.

B. Approved control panel fabricators are as follows:

1. General Control Systems (GCS)
2. Keltour
3. Or ENGINEER approved equal

C. The control panel enclosure shall be designed and sized in accordance with the requirements of the Drawings and as specified herein. The control panel enclosure shall be manufactured by Hoffman or ENGINEER approved equal.

D. Design and fabricate all control panels in accordance with UL 508A.

1. All panels shall bear the UL listing mark for enclosures stating "Listed Enclosed Industrial Control Panel" per UL 508A.

E. All panel components shall be rated for the maximum expected temperature of the control enclosure. Service Providers must provide calculations showing that all components meet the maximum expected control panel temperature including solar heat gains. Service Providers shall install appropriate cooling methods as required.

F. Control panel enclosures located in conditioned spaces shall be NEMA 4X 5052 aluminum for process areas or for non-process areas. All panels shall be provided with the appropriate quantity of corrosion-inhibiting vapor capsules.

1. Panels with any dimension greater than 36-inch shall be 12 USS gauge minimum.
2. Piano type hinged, overlapping doors with neoprene gasket. Doors shall be equipped with a heavy-duty 3-point latching mechanism operated by a padlocking handle.
3. Following fabrication, the control panel shall be degreased and cleaned.
4. All panels shall have continuously welded seams.

G. Control panel enclosures located in unconditioned spaces or outside shall be NEMA, 4X, 0.125-inch 5052 marine grade aluminum and equipped with the following:

1. Piano type hinged, overlapping doors with neoprene gasket. Doors shall be equipped with a heavy-duty 3-point latching mechanism operated by a padlocking handle.
2. Following fabrication, the control panel shall be degreased and cleaned.
3. All panels shall have continuously welded seams.
4. Panel enclosures shall be equipped with aluminum sun shields of the same grade and thickness material as the panel. Sunshields shall be mounted with 1.5 inch of separation from the panel, in a manner that maintains the NEMA rating of the panel. Include appropriate sun shields on top, sides, and front, free standing enclosures will require heat shields on back as well.
5. Panels shall be constructed with thermostatically controlled anti-condensation space heaters.
6. The maximum size of an aluminum enclosure shall be no taller than 60-inch wide or 60-inch high with 12-inch floor stands for a total height of 60-inch. Any enclosure that requires a larger size shall be 316 SS.
7. Aluminum enclosures with free standing bases shall have the bases manufactured out of 316 SS, to give extra strength.

H. Panel Finishes

1. Marine Grade Aluminum: Factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting polyester powder topcoat. The inside of the panel shall be white, and the exterior shall be white.
2. Carbon Steel: Factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting powder topcoat. The inside of the panel shall be white, and the exterior shall be white.
3. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.

I. Hardware / Fasteners:

1. All Hardware and Fasteners shall be 316 stainless steel.
2. All mounting screws shall be drilled and tapped; no self-tapping screws are allowed.

J. Provide a plastic data pocket in the control panel. Data pocket shall be attached to the lower portion of the enclosure door or the lower right door of two door models.

K. Instrumentation Wire

1. Cable for 4-20mA analog instrumentation circuits shall be multi-conductor twisted, tinned, 18 AWG, with a FOIL and BRAIDED shield.
2. Insulation is to be stripped back 6-inch from the terminal connection to allow clamp on measurement of 20ma loop.

L. Discrete Signal Wire

1. Cable for 24VDC to 120VAC discrete signal control circuits shall be minimum #16 AWG stranded ASTM Standard B-8.
2. Insulation is to be stripped back 6-inch from the terminal connection

2.02 PANEL MOUNTED DEVICES

A. Enclosure Door Switches

1. Provide door switches on the enclosure doors for remote indication that the door is open.
2. The door switch shall be comprised of a microswitch with a swing-arm activation mechanism.
3. Enclosure door switches shall be manufactured by Eaton, Siemens, Hoffman, or ENGINEER approved equal.

B. Enclosure Lighting

1. Panel shall have adequate lighting.
2. Door switched LED lighting with protective lighting cover operating at 24VDC.
3. Smaller panels shall have an LED panel light with integral switch.
4. Larger panels shall have an LED panel light with a remote switch.

C. Control Circuit Breakers

1. Control circuit breakers shall be of energy-limiting design and field-mountable for selective applications.
2. Circuit breakers shall mount on a DIN rail.
3. Control Circuit breakers fed by an integral Control Power Transformer shall have a UL/CSA Rated Interrupt Capacity of 10,000 A.
4. Circuit breakers shall be manufactured by:
    a. Rockwell (Allen-Bradley)
    b. Square D
    c. Eaton
    d. or ENGINEER approved equal

D. Aluminum DIN Rail mount as manufactured by Allen-Bradley, Weidmueller, or Phoenix Contact.

E. Surge Protection Devices

1. The Control Panel will have a minimum Type 2 SPD with a surge capacity of 40 kA at 8 x 20 us or above.
2. All surge protection devices shall be monitored by a discrete input to the PLC.
3. Outdoor Surge Suppression:
    a. NEMA 4X Enclosure
    b. UL 1449 Listed
    c. LED Indication where available

d. Provide surge suppression for all fields 2, 3, and 4-wire instrumentation
e. Manufacturers:
    i. Phoenix Contact
    ii. Citel
    iii. Emerson

4. Enclosure Surge Suppression:
    a. IP 20 DIN Rail Mounting
    b. Pluggable surge device with base socket
        i. DITEK (DTK-120HWLOK)
    c. Grounded via DIN Rail
    d. LED indication where available
    e. UL 1449 Listed
    f. Provide surge suppression for:
        i. Incoming power connections
        ii. Analog signal lines
            (a) 4-20 mA surge protection
        iii. Communication signal lines
            (a) Coaxial ground kit LM400
        iv. Fusible for digital inputs and digital outputs w/ lit LED when fuse is bad (e.g. Phoenix Contact #3038765)
    g. Manufacturers:
        i. Phoenix Contact
        ii. Citel
        iii. Emerson

F. Volt DC Power Supplies
1. Approved vendors:
    a. APC (Schneider Electric)
    b. Orion Power Systems
2. All control devices such as PLC, HMI and other such devices shall be on its own clean 24VDC power supply and is to be separate from the field power.
3. Provide a second Power supply for 24Vdc power for control device communications power.
4. Provide dedicated single channel signaling selectivity modules for equipment such as PLC, HMI, switches, etc. Modules shall be monitored by discrete inputs to the PLC.
5. All Field Power is to have its own power supply dedicated for control loops such as 4-20ma.

6. UPS –Uninterruptible Power Supply
    a. All control devices such as PLC, HMI and other such devices shall be on its own UPS.
    b. Provide a second UPS for 24Vdc power for control device communications power.
    c. Minimum backup runtime:10 minutes
    d. Bypass selector switch.
    e. Server UPS Minimum requirements:
        i. Must be rack mountable (2U)
        ii. Must have network monitoring capabilities
        iii. 1500VA, 120V
        iv. Total Outlets (or more)
7. 24-Volt DC power supplies shall be mounted in control panels to supply 24-Volt DC power for the programmable controller inputs and for the 2-wire instrumentation and for 4-Wire instrumentation and communications power.
8. The power supplies shall be sized as required plus 25% spare capacity. Load calculations shall be provided with the control panel shop drawing submittal.
9. Provide a redundancy module for the power supplies.
10. The 24-volt DC power supplies shall be manufactured by:
    a. Phoenix Contact Quint4 Series
11. IP20 DIN Rail Mounting
12. UL 508 Listed
13. Grounds common and power for each electrical device shall have its own wire connected to one central distribution. Daisy chained shall not be accepted.

G. Selector Switches (Where specified on drawings)
1. Selector switches shall be 30.5 mm, heavy-duty, and non-illuminated.
2. Switches shall have double-break silver contacts and shall be maintained contact type unless otherwise indicated on the Drawings. Auxiliary contact blocks shall be provided on switches where indicated on the Drawings or in the Description of Operation.
3. Selector switches shall carry the same NEMA rating as the panel on which installed.
4. Provide a white legend plate for each switch with black engraving as indicated on the Drawings.
5. Selector switches shall be manufactured by:
    a. Rockwell (Allen-Bradley)
    b. Square D
    c. or ENGINEER approved equal

H. Push Buttons (Where specified on drawings)

1. Push buttons shall be 30.5 mm, heavy-duty, non-illuminated.
2. Push buttons shall have double-break silver contacts, momentary contact type and shall be color-coded as indicated on the Drawings. Push Buttons without a color indication shall be black.
3. Push buttons shall carry the same NEMA rating as the panel on which installed.
4. All push buttons shall have flush heads unless otherwise indicated on the Drawings.
5. Provide a white legend plate for each push button with black engraving as indicated on the Drawings.
6. Selector switches shall be manufactured by:
    a. Rockwell (Allen-Bradley)
    b. Square D
    c. or ENGINEER approved equal

I. Pilot Lights (Where specified on drawings)

1. Pilot lights shall be 30.5 mm, heavy-duty, push to test, with universal LED lamps. Lens color shall be as indicated on the drawings.
2. Pilot lights shall carry the same NEMA rating as the panel on which installed.
3. Provide a white legend plate for each pilot light with black engraving as indicated on the Drawings.
4. Selector switches shall be manufactured by:
    a. Rockwell (Allen-Bradley)
    b. Square D
    c. or ENGINEER approved equal

J. Relays, General Purpose

1. General purpose relays as shown on the drawings shall be UL labeled, industrial grade as manufactured by:
    a. Allen Bradley
    b. Square D
2. Relays shall have LED indication of energized/de-energized state.
3. Relays shall have latching Levers.

K. Interposing Relays – Used with PLC I/O

1. Interposing relays shall be miniature industrial type with 120 VAC coils or pluggable miniature type for 24 VDC coils, DIN rail mounted.
2. Rated for minus 25-to-40-degree C.
3. Relays shall have LED indication of energized/de-energized state.
4. Relays shall be push-to-test type
5. Relays shall be SPDT or DPDT type with AgNi contacts rated for 6A resistive minimum.

6. Interposing relays shall be manufactured by:
    a. Allen Bradley
    b. Square D

L. Fuses (Where specified in the drawings)
1. All fuses shall be sized as required for the circuit they are protecting.
2. Fuses shall be rated at 600 VAC/170 VDC (1/2-20 A) and 480 VAC/300 VDC (25 – 60 A).
3. Fuses shall be listed UL Std. 248.
4. Fuses shall be supplied with manufacturer recommended fuse blocks.
5. Fuses shall be manufactured by:
    a. Cooper Bussman, Inc.
    b. Ferraz Shawmut, Inc.
    c. Littlefuse, Inc.
    d. Edison Fuse, Inc.
    e. or ENGINEER approved equal

M. Terminal Blocks
1. Terminal Blocks shall be by:
    a. Phoenix Contact
    b. Allen-Bradley
    c. Square D
    d. Or approved equivalent
2. The minimum size shall be 4mm.
3. Rated for minus 55-to-110-degree C
4. Label all terminal blocks with appropriate numbers
5. Terminals colors are to match UL508A voltage color code
6. Single level
7. Screw Compression Clamp
8. All field wiring shall land on din-rail mounted terminal blocks near the bottom of the control panel prior to distribution within the control panel.
9. Provide 20 percent spare installed terminal block
10. All spare I/O shall be brought out to terminal blocks for future use.
11. Like devices, equipment, or signals shall be grouped together on terminal blocks. Terminal block layout shall provide for future expansion without the need for renumbering.
12. All terminal blocks shall be rated for 600 volts AC and shall be identified with a permanent machine printed marking.
13. A maximum of two (2) wires shall be provided per terminal block.

14. Field signal terminal blocks:
    a. 24Vdc/120Vac Fuse modular terminal block.
    b. 120Vac Fuse modular terminal block
15. For multiplex signal terminal blocks:
    a. 120v Four-conductor terminal block
    b. 24v Feed-through terminal block
16. Feed through terminal blocks
17. For Isolation or disconnect terminal blocks:
    a. Single level knife disconnect terminal blocks
    b. Double level knife disconnect terminal
18. Analog signal (Input and Output) terminal blocks:
    a. Fuse modular terminal block

N. GFCI Convenience Outlet

1. GFCI convenience outlets shall be UL labeled, industrial grade, and DIN rail mounted. GFCI outlets shall be rated for 120 VAC, 15 A.
2. GFCI convenience outlets shall be labeled with the tag number indicated in the Contract Drawings and shall clearly indicate the maximum current available.

O. Wiring

1. Type and Identification
    a. All Wire Colors in the panel are to follow the UL508A standards.
    b. Control Wiring shall be numbered / lettered at each end. Wire numbers / letters shall be Flattened Polyolefin Heat Shrink Markers for Permanent Wire and Cable Identification (Panduit) or JEA approved equal.
2. All interior control panel control wiring shall be stranded copper #18 AWG, 600V, Type RHW2.
3. All interior control panel analog signal wiring shall be 18 gauge, twisted-shielded pairs with foil shield and drain wire. Analog signal wire shall be manufactured with 600V, 75° insulation.
4. All wiring and terminal strips shall be isolated by voltage levels to the greatest possible extent.
5. Wiring shall be continuous with no splices.
6. Exterior panel wiring shall be as indicated on the Drawings.

P. Wiring Duct

1. Wiring Duct shall be as follows
    a. Panduit Wide Slot with a Hinged Cover. Non hinged covers will not be accepted.
2. All wiring within panels shall be installed in duct-type wireway. Where wireway is not practical, conductors shall be installed in a flexible protective sleeve.

3. Wiring Duct is to have a maximum fill limit of 40%.
4. All control and power wiring shall be terminated on terminal blocks. The use of wire-nuts, splices, or similar free-air connections is strictly prohibited.
5. The outside edge of the Panduit can be placed no closer than 2 inches to the nearest terminal edge or component. This is to allow adequate space to wire the terminals.
6. Wire Duct installed on the outside edges of the back panel must be a minimum of 2 inches from the edge of the back panel.

Q. Grounding Bus

1. Provide a copper isolated grounding bus inside the control panel for terminating all ground wires.
2. Grounding busses shall be 2-inch x ¼-inch x 12-inch long and manufactured of copper. Grounding busses used for isolated grounds shall be provided with a standard hardware kit that includes fixtures for isolation from the panel. The installation kit shall include at least one #2 compression lug.
3. Grounding busses shall be manufactured by:
   a. Cooper Industries (SBTGBK)
   b. Panduit
   c. Eritech
   d. or ENGINEER approved equal

R. Nameplates

1. Nameplates are to be provided for all individual panels, instruments and panel mounted devices.
2. Use plastic laminate nameplates having engraved black letters on a white background.
3. Letters must be a minimum of 24 Font.
4. Nameplate must be visible when devices are wired

S. Programmable Logic Controllers

1. PLC system shall be Rockwell, Allen Bradley CompactLogix5580E.
2. Provide a complete PLC system with processors, communication modules, local and remote I/O modules and other system components as shown on the Drawings. All PLC hardware components shall be configured to perform the functions shown on the Drawings and within these specifications.
3. The PLC shall be suitable for use under the following environmental conditions:
   a. Operating temperature: 0°C to 60°C for horizontal configuration
      0°C to 40°C for vertical configuration
   b. Relative humidity: 95% at 25°C, non-condensing
4. The PLC or Distributed I/O shall be provided with approximately 20% spare I/O points.

a. All spares are to be wired to terminals

5. The CONTRACTOR shall provide all Ethernet switches, adapters, connectors, and interconnection cables necessary to connect the PLCs to the network. Network isolators shall be required on all ethernet based networks originating from field devices outside of the main pump building.
6. Analog Input modules shall be isolated from the backplane and each channel shall be individually isolated from each other.
7. Each Input module shall have two fuses to divide the inputs
8. Maximum I/O per card shall be as follows:

a. Discrete Input - 16
b. Discrete Output - 16
c. Analog Input - 8
d. Analog Output -8

T. Operator Interface Terminals (OITs)

1. OITs shall be Manufactured by Allen Bradley and shall be (PanelView 5000), or Engineer Approved Equivalent.
2. OITs shall have at a minimum a 10-inch, high resolution, touch screen, color display with Ethernet connectivity
3. Includes Logix-based alarms to eliminate need for additional configuration
4. Achieves <100 ms response for machine jogging applications with a high-speed HMI button
5. Provides Logix tag extended property support to help develop richer context
6. Features a modern design with a slim bezel
7. Allows for the ability to create custom, re-usable add-on graphics to more efficiently build your applications
8. Shares tags, alarms, and other data using Studio 5000 View Designer™ environment automatically
9. Offers emulator to test run a project without downloading to a physical terminal
10. Uses a built-in VNC server to support a remote VNC client for monitoring and troubleshooting
11. Units shall be UL Listed.

U. Communication Networks

1. Communications shall be capable of using Ethernet/IP and OPC protocols.
2. The PLC shall be capable of peer-to-peer communications that provide for the direct transfer of process data between controllers without the use of gateways or servers.
3. PLC chassis shall be capable of containing one or more communication modules to provide communication interfaces to other devices, including, but not limited

to: remote workstations, HMIs, and PLCs by other manufacturers. As a minimum, the PLC shall support the following without the need for third-party modules:

a. Ethernet (10/100MB).
b. Serial protocols including Modbus and ASCII.

V. Auto Dialers

1. Auto Dialers shall be manufactured by RACO Manufacturing and Engineering Co. and be Verbatim model with the Cellularm option included.
2. Standard Specifications: Electrical
   a. Power requirement:105-135 VAC, 50/60 Hz, 15 watts maximum or 8-14 VDC at 500 mA maximum.
   b. Battery charging: Precision voltage controlled, including automatic rapid recharge after drain. Battery backup: 20 hours
   c. Input sensing: Four unpowered contact inputs standard. Open contacts 5 volts DC; closed contacts see 10 ma DC.
3. PHYSICAL
   a. Surge protection: Integral gas tube and solid-state protectors on all phone, power, and signal lines. Accommodates field-installed upgrades. Rugged metal indoor enclosure.
   b. Temperature range: 20˚ to 130˚F.
   c. Humidity: 0 to 95%, noncondensing.
4. TELEPHONE
   a. Rotary pulse or tone dialing, keyboard selectable
   b. Dials up to 16 different numbers, each up to 60 digits long.
   c. Allows programming of PBX delays in 1 second increments.
   d. FCC Registered Part 68, “Ringer Equivalence”: 0.3A.
   e. Alarm Acknowledgement is by Touch-tone key or by calling back.
   f. Built-in speaker phone allows two-way conversation
   g. Compatible with most cellular telephone systems. SPEECH MESSAGES
   h. Users record their own messages. Also includes resident vocabulary for programming guidance and for default “alarm/ normal” speech if no user messages are recorded.
5. MODULAR OPTIONS
   a. Analog. Custom scaled in the units of measurement required for your job. Analog alarms on a high and a low alarm setpoint. Upgradeable to 1, 4, 8 or 16 analog channels. Remote Supervisory Control. The operator can turn equipment on or off via any telephone. Upgradeable to 4 or 8 outputs.
   b. Channels. Upgradeable to 8, 16, 24 or 32 contact channels.
   c. Modbus Interface. In addition to physical inputs, the unit is upgradeable to 32, 64 or 96 additional alarms of any type via RS232 and Modbus RTU master protocol.
   d. Cellular Telephone. Cellularm™ System provides temporary or permanent alarm autodialing over the cellular telephone network when conventional

telephone lines are disabled or unavailable. Furnished in a rugged, weather-resistant housing that's easy to transport and set up.

6. FACTORY OPTIONS

   a. Enclosure. System available in NEMA 4X enclosure, which is corrosion proof and sealed against 12 feet of water.
   b. Environmental. Thermostatically controlled heater available, suggested for operation below 20˚F or where condensation may occur.
   c. Local Alarm Relay Output. Relay activates during unacknowledged alarm conditions. Secure Front Panel. Verbatim System furnished without front panel programming controls and indicators. Restricts access to unsupervised or remotely located units, as well as reducing the initial purchase price.

PART 3 – EXECUTION

3.01 PREPARATION

A. Factory acceptance testing shall be in accordance with Section 16991. Testing shall occur at the panel fabricators facility or a facility chosen by the CSI. CSI shall coordinate all testing requirements, notifications to OWNER and ENGINEER, and reporting results. CSI or panel fabricator shall prepare a FAT testing protocol document and submit to the OWNER and ENGINEER for review and approval at least 3 weeks in advance of planned FAT testing.

B. Start-up and Testing

1. Check the panel for conformity with the approved shop drawings for the panel being supplied.
2. Provide a minimum of 16 hours for onsite support to be used at the direction of the OWNER or ENGINEER for field required modifications to the control panels.
3. Test the operation of the control panel and all controls.
4. Test the operation of all communication equipment.
5. All start-up and testing shall be performed in the presence of OWNER or the ENGINEER. CSI or panel fabricator shall notify SJCUD of factory testing a minimum of two (2) weeks in advance if they are geographically located within St. Johns County, FL or four (4) weeks in advance if they are geographically located outside of St. Johns County, FL for witnessing testing.
6. Any field revisions to the control panels shall be documented and incorporated into final O&M manuals. Additionally, shop drawings shall be updated and resubmitted to the ENGINEER for record keeping purposes.

C. Training

1. Provide up to 16 hours of training for the OWNER's personnel on the operation of the control panel.
2. Training shall be provided on at least two separate days and two separate shifts, as necessary, to accommodate personnel on all work schedules and shifts.
3. Training shall include operation of the controls and troubleshooting procedures.

SECTION 16910

CONTROL PANEL CONSTRUCTION

END OF SECTION 16910

SECTION 16930

FUNCTIONAL CONTROL DESCRIPTION

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This section describes the general function of each primary control loop to be modified or included. The Control System Integrator shall provide additional functions as needed to adhere to good control and engineering practices. These additional functions shall be outlined and explained as part of the submittal process.

B. The CONTRACTOR will be responsible for securing a Control System Integrator (CSI) for completing all control and implementation work described herein and as reflected on the Drawings to provide a fully operational booster pumping station.

C. Refer to section 16900 for “Control System Integrator”.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 SYSTEM DESCRIPTION

A. This project includes work at North Beach Water Treatment Plant including the following proposed or existing auxiliary systems:

1. Proposed Feed Pump System
2. Proposed Reverse Osmosis Skids with anti-Scaling Feed System
3. Existing Clear Well System (Base Bid)
4. Proposed Degassifier/Biotrickling System (Bid Alternate)
5. GST Feed Pumps System (Bid Alternate)
6. Existing Ground Storage Tank - GST
7. New High Services Pumps System
8. Existing Sodium Hypochlorite System

B. In general, all process functional control and annunciation available locally at the Plant control panel shall be available for remote viewing and control through the SCADA Network including the operator’s workstation HMIs located in the treatment building.

C. Overall requirements of the operating and control system are as described in the functional descriptions in these specifications as well as the instrumentation and control schematics included in the project drawings.

D. General functionality of the motor driven equipment includes field mounted “On-Off-Remote” selectors and MCC mounted “Local-Off-Remote” selector switches. In the

"Remote" position, the motors shall be controlled from the water treatment plant control system based on the descriptions provided in these specifications. In the "Local" position, the motors shall be called to run manually from the device or indicated panel. In the "On" position, the motors shall be called to run; for VFD driven motors, the motors shall run at preset speed.

E. Return from power loss:

1. Following the restoration of power from any power loss event, the control system shall reset all applicable devices and automatically resume operation of the systems described.

3.02 ALARM CONDITIONS

A. All alarm conditions for the proposed equipment shall:

1. Be displayed on the HMI (Human Machine Interface) located on Plant Control Panel (PCP-1) in the electrical room of the Treatment Building.
2. Be displayed on the operator's workstation HMIs located in the treatment building.
3. Be recorded in the HMI alarm database

B. Alarm conditions shall be available for remote viewing and control through the SCADA Network as indicated within the drawings.

3.03 PASSWORD PROTECTION

A. Programming functions shall be password protected within the HMI to prevent accidental manipulation of pump PID control loop settings. Coordinate with Saint John's County Utility Department (SJCUD) for additional items to be password protected.

B. System shall have login functions for Admin (Full read/write control), Engineer (Full read/write control), and Operator (Limited visibility and setpoint adjustment)

3.04 DATA ARCHIVAL AND TRENDING

A. The HMI shall be configured to trend all points connected to the station control system within the HMIs available memory as indicated in the I/O lists shown on the Drawings and consistent with industry standards.

3.05 MANUFACTURER PROVIDED CONTROLS

A. This Project includes several pre-packaged Vendor provided control panels and systems that will be required to be integrated into PCP-1 and the SCADA Network for monitoring equipment status and alarms as well as providing remote control at the Operator's workstation HMIs located in the Treatment building. The CSI will NOT, however, be responsible for programming the controls algorithms required for these packaged systems to function as specified in other sections, unless hired by the vendor to do so.

1. Vendor provided Systems include, but not limited to:

a. Reverse Osmosis Skid Systems include:

i. Pressure Transmitters
ii. Low feed Switch
iii. High discharge Switch
iv. Inlet valve
v. Auto Flush Valve
vi. Conductivity Monitor
vii. Conductivity Sensors
viii. Flow Sensors
ix. Flow Indicator
x. pH and ORP probes
xi. Variable Frequency Drives (VFD)
xii. High Pressure Pumps
xiii. Remote I/O Panel
xiv. Anti-scalant Metering Pumps

b. Degassifier/Biotrickling System:
i. Flow Indicator
ii. Variable Frequency Drive (VFD)
iii. Recirculation Pumps
iv. Exhaust Fan/Blower
v. Remote IO Panel

B. Refer to the Project Drawings for additional details on the devices included for each of these processes and the required integration.

C. The CSI shall be responsible for integrating the

D. The CSI shall be responsible for coordinating with the system vendors and manufacturers to fully integrate these systems into the SCADA Network.

3.06 RO FEED PUMPING SYSTEM CONTROL DESCRIPTION

A. The WTP utilizes two artesian production wells to source water. The feed pumping system will be an in-line booster system to convey water from the artesian production wells to the RO Skids.

B. Motor Operate Valve (MOV-061)

1. The RO bypass line will include a motor operated valve equipped with a proximity sensor.

2. The proximity transmitter will report the valve position to PCP-1 and the SCADA Network.

3. The HMI on PCP-1 shall display the following:

a. Instantaneous valve position

C. Flow meter (FIT-050)

1. The RO bypass line will include a new flow meter.
2. The flow transmitter will report the RO bypass flow rate to PCP-1 and the SCADA Network.
3. The HMI on PCP-1 shall display the following:
    a. Instantaneous flow of the discharge line.
    b. Totalized flow for the current day
    c. Totalized flow for the current month
4. The Control System shall trend and historize the totalized flow.

D. RO Feed Pumps (P-010, P-020, P-030)

1. The GST feed pumping system will consist of three new horizontal pumps to convey water from the Degassifier/Biotrickling System into the GSTs.
2. PCP-1 and SCADA Network shall monitor and control the status of the GST Feed Pumps.
3. PCP-1 and SCADA Network shall monitor the status of pump faults and availability of the pumps.

E. Motor Starters (MS-010, MS-020, MS-030)

1. The GST feed pumping system will include three new motor starters.
2. PCP-1 and SCADA Network shall monitor and control the status of the motor starters.
3. PCP-1 and SCADA Network shall monitor the status of motor starter faults and availability of the motor starters.
4. PCP-1 and SCADA Network shall monitor the run times for each pump.
    a. Run times shall be reported in whole hours.
    b. The Control System shall trend and historize the totalized pump run time over the past 12 months. In the trending area of the HMI, the control system shall allow the operator to trend totalized pump run times for a selectable period of up to 12 months.
    c. A password protected pump run time reset button shall be provided on the HMI.
5. For the motor starters, the HMI shall display the following:
    a. Remote/Local Status
    b. Run Status
    c. Fault Status
    d. Pump Run Time
6. The Operator shall be able to send a remote reset signal from PCP-1 and SCADA Network.
7. Interlocks

a. The control system shall interlock the pumps and prevent running under the following conditions with a password protected override for each:
    i. High Motor Thermal
    ii. Remote Stop Switch
    iii. GST High Level Alarms

8. When in remote mode, the VFDs shall operate the pumps in accordance with the narrative below.

F. For further details on the field devices, refer to the project drawings.

G. RO Feed Pump Operation

1. The feed pumping system consists of three new horizontal pumps.
2. The pumps shall operate in a 2 duty + 1 standby configuration (lead/ lag/ standby). The plant control system shall rotate duty and standby pumps every 24 hours as follows:
    a. The pump with the lowest accumulated run time shall be designated as the Lead pump.
    b. The pumps with the next lowest accumulated run times shall be designated as Lag 1 pump.
    c. The pump with the highest accumulated run time shall be designated as the Standby pump.
3. During remote operation, the control system shall modulate MOV-061 to maintain the pressure to the RO skids. The pressure setpoint shall be coordinated with the RO skid manufacture.
4. Refer to paragraph 3.11.C. for GST fill process control narrative for additional requirements.

3.07 REVERSE OSMOSIS SKID SYSTEM'S CONTROL DESCRIPTIONS

A. Reverse osmosis skid systems

1. The Reverse Osmosis Skid Control System Control Panel will be provided by the successful process vendor.
2. Refer to the Project Drawings for the anticipated devices and signals to be monitored through the control system. The project drawings are considered a basis of design, and it shall be the responsibility of the CSI to coordinate final equipment, instrumentation, and control signals to be integrated into PCP-1 and the SCADA Network.
3. The CSI shall be responsible for replicating the data provided for these systems and providing a means of remotely running and monitoring the devices through PCP-1 and the SCADA Network as would be accomplished from the manufacturer's controls.
4. Refer to paragraph 3.11.C. for GST fill process control narrative for additional requirements.

3.08 CLEAR WELL PUMP SYSTEM (BASE BID)

A. The Clear Well System shall use existing equipment. CONTRACTOR shall verify all field equipment and instrumentation prior to integration into PCP-1 and the SCADA Network.

B. The Clear Well System serves as a sump for the gravity line that conveys water from the existing aerators before the water is transferred into the GST.

C. Clear Well Level Transmitter (LIT-413)

1. The Clear Well System level transmitter shall report the clear well level to PCP-1 and SCADA Network for remote monitoring.

2. The operator shall be able to set the following setpoints: Clear Well Low Level, Level Rise to Start the Pump, Desired Well Level, Level Drop to Stop the Pump, and Clear Well High Level.

3. The HMI located on PCP-1 Shall display the following:

a. Instantaneous level of the Clear Well.
b. Scaled representation of the Level Setpoints Described
c. High Level Alarm
d. Low Level Alarm

D. Clear Well Float Switches (LSH-411, LSL-412)

1. The Clear Well level switches shall be set for the following:

a. Back up Low Level Alarm (Stop Pumps)
b. Back up High Level Alarm (Start Pumps)

2. The HMI located on PCP-1 Shall display the status of the floats for the Clear Well System.

E. The CONTRACTOR shall set the elevations in the field at the direction of the OWNER and ENGINEER. Record setpoint elevations and ranges in the following table and in the construction as-built documents.

Transmitter ID	**Description**	**Setpoint/ Range**
LSH-411,LIT-413	Clear Well High Level Alarm	TBD ft
LIT-413	Level Rise to Start a Pump	Desired + TBD ft.
LIT-413	Desired Well Level	TBD ft
LIT-413	Level Drop to Stop Pump	Desired – TBD ft
LSL-412,LIT-413	Clear Well Low Level Alarm	TBD ft
LIT-413	Clear Well Level Display Range	TBD-TBD ft

F. Clear Well Pumps (P-400)

1. The Clear Well is equipped with a Vertical Turbine Pump that pumps water into the GST.

2. PCP-1 and SCADA Network shall monitor and control the status of the Clear Well.

3. PCP-1 and SCADA Network shall monitor the status of the pump fault and availability of the pump.

4. For further details on the field devices, refer to the project drawings.
5. When in remote mode, the pump shall operate in accordance with the narrative below.
6. For the pump, the HMI shall display the following:
    a. Pump in Remote Status,
    b. Pump in Local Status,
    c. Pump Running,
    d. Pump Fault Status,
    e. External Fault Status.
    f. Start/Stop Command
7. The Operator shall be able to send a remote reset signal from PCP-1 and SCADA Network.
8. Interlocks
    a. The control system shall interlock the pump and prevent running under the following conditions with a password protected override for each:
        i. Low Level Alarm
        ii. High Motor Thermal
        iii. GST High Level Alarms

G. Clearwell Operation

1. Normal Pump Operation to maintain level.
2. The control system shall monitor the level of the Clear Well level transmitter. The operator shall enter a “Desired Level” (within an allowable Admin user adjustable range) to be seen at the level transmitter HMI graphic interface.
3. Rising Level:
    a. As the level rises above the “Desired Level” plus the “Level Rise to Start Pump” for an adjustable time delay (10 seconds initial), the control system shall start the pump.
4. Falling Level:
    a. As the level drops below the “Desired Level” - “Level Drop to Stop Pump” the control system shall shutdown the pump.
5. Float Back-up Operation
    a. The Clearwell shall be equipped with a float back-up system to operate the Clearwell Pump in the event of a PLC failure or failure of the level transmitter.
    b. As the level rises to the back-up high-level float, the back-up system shall start the pump at a preset speed.
    c. The pump shall continue to operate until the level falls below the back-up low-level float, at which point the pump shall stop.
6. Refer to paragraph 3.11.C. for GST fill process control narrative for additional requirements.

3.09 DEGASSIFIER/BIOTRICKLING SYSTEM (BID ALTERNATE)

A. Degassifier/Biotrickling system

1. The Degassifier/Biotrickling Control System Control Panel will be provided by the successful process vendor.
2. Refer to the Project Drawings for the anticipated devices and signals to be monitored through the control system. The project drawings are considered a basis of design, and it shall be the responsibility of the CSI to coordinate final equipment, instrumentation, and control signals to be integrated into PCP-1 and the SCADA Network.
3. The CSI shall be responsible for replicating the data provided for these systems and providing a means of remotely running and monitoring the devices through PCP-1 and the SCADA Network as would be accomplished from the manufacturer's controls.
4. Refer to paragraph 3.11.C. for GST fill process control narrative for additional requirements.

3.10 GST FEED PUMPING SYSTEM CONTROL DESCRIPTION (BID ALTERNATE)

A. GST Feed Pumps (P-401, P-402)

1. The GST feed pumping system will consist of two new VFD driven horizontal pumps to convey water from the Degassifier/Biotrickling System into the GSTs.
2. PCP-1 and SCADA Network shall monitor and control the status of the GST Feed Pumps.
3. PCP-1 and SCADA Network shall monitor the status of pump faults and availability of the pumps.

B. Variable Frequency Drives (VFD-401, VFD-402)

1. The GST feed pumping system will include two new VFDs.
2. PCP-1 and SCADA Network shall monitor and control the status of the VFDs.
3. PCP-1 and SCADA Network shall monitor the status of VFD faults and availability of the VFDs.
4. PCP-1 and SCADA Network shall monitor and control the speed of each pump.
    a. Pump speed shall be reported in % speed and Hz.
    b. The Control System shall trend and historize the pump speeds over the past 12 months. In the trending area of the HMI, the control system shall allow the operator to trend pump speeds for a selectable period of up to 12 months.
5. PCP-1 and SCADA Network shall monitor the run times for each pump.
    a. Run times shall be reported in whole hours.
    b. The Control System shall trend and historize the totalized pump run time over the past 12 months. In the trending area of the HMI, the control system shall allow the operator to trend totalized pump run times for a selectable period of up to 12 months.

c. A password protected pump run time reset button shall be provided on the HMI.

6. For the VFDs, the HMI shall display the following:

a. Remote/Local Status
b. Run Status
c. Fault Status
d. Speed Command
e. Speed Reply
f. Pump Run Time

7. The Operator shall be able to send a remote reset signal from PCP-1 and SCADA Network.

8. Interlocks

a. The control system shall interlock the pumps and prevent running under the following conditions with a password protected override for each:

i. GST High Level Alarms

ii. High Motor Thermal

9. When in remote mode, the VFDs shall operate the pumps in accordance with the narrative below.

C. For further details on the field devices, refer to the project drawings.

D. GST Feed Pump Operation

1. The GST feed pumping system consists of two VFD driven horizontal pumps.

2. The pumps shall operate in a duty/standby configuration. The plant control system shall reselect the duty and standby pump every 24 hours. The pump with the lowest runtime shall be the duty pump, the pump with the highest run time shall be the standby pump.

3. During remote operation, the control system shall continuously modulate the pump speed to match the pump discharge flow rate to the measured discharge flow rate from the Degassifier/Biotrickling system.

4. Refer to paragraph 3.11.C. for GST fill process control narrative for additional requirements.

3.11 GROUND STORAGE TANKS

A. GST level transmitters (LIT-423, LIT-433)

1. The Ground Storage Tanks are existing. GST No. 1 includes an existing radar level transmitter and GST No. 2 shall be provided with a radar level transmitter. The level transmitters will report the tank level to the PCP-1 SCADA Network.

2. The operator shall be able to set the following setpoints: Tank Low Level, and Tank High Level.

3. The HMI shall display the following:

a. Instantaneous level of the ground storage tank.

b. High Level Alarm
c. Low Level Alarm

4. The CONTRACTOR shall set the elevations in the field at the direction of the OWNER and ENGINEER. Record setpoint elevations and ranges in the following table and in the construction as-built documents.

Transmitter ID	Description	Setpoint/ Range
LIT-423	GST High Level Alarm	TBD ft
	GST Stop Fill	TBD ft
	GST Start Fill	TBD ft
	GST Low Level Alarm	TBD ft
LIT-433	GST High Level Alarm	TBD ft
	GST Stop Fill	TBD ft
	GST Start Fill	TBD ft
	GST Low Level Alarm	TBD ft

B. Ground storage level switch backups (LSH-421, LSL-422, LSH-431, LSL-432)

1. Each GST shall be equipped with two float switches to serve as a backup level control in the event of a failure of the Level Transmitter.

2. The HMI shall display the following:

a. GST Backup High Level Alarm
b. GST Backup Low Level Alarm

3. The CONTRACTOR shall set the float elevations in the field at the direction of the OWNER. Record float elevations in the following table and in the construction as-built documents.

Float ID	Description	Elevation
LSH-421	Backup High Level Alarm	TBD ft
LSL-422	Backup Low Level Alarm	TBD ft
LSH-431	Backup High Level Alarm	TBD ft
LSH-432	Backup Low Level Alarm	TBD ft

C. Ground Storage Tank Operations

1. Normal Tank Operation to maintain level.

2. GST fill operations includes the following processes:

a. RO Feed Pumping System, reference paragraph 3.06
b. RO Skid Systems, reference paragraph 3.07
c. Clearwell Pumping System (base bid), reference paragraph 3.08
d. Degassifier/Biotrickling System (bid alternate), reference paragraph 3.09
e. GST Feed Pumping System (bid alternate), reference paragraph 3.10
f. Sodium Hypochlorite Dosing System

3. The control system shall monitor the level of the tanks. The operator shall enter a “Desired Level” (within an allowable Admin user adjustable range) to be seen at the level transmitter HMI graphic interface.

4. Falling Level:

a. As the level drops below the “GST Start Fill” setpoint for an adjustable time delay (10 seconds initial), the control system shall start the GST fill process.

5. Rising Level:

a. As the level rises above the “GST Stop Fill” setpoint for an adjustable time delay (10 seconds initial), the control system shall shut down GST fill process.

6. Float Back-up Operation

a. The tanks shall be equipped with a float back-up system to operate GST fill process in the event of a PLC failure or failure of the level transmitter.
b. As the level falls below the back-up low-level float, the back-up system shall stop start the GST fill process.
c. The GST fill process shall continue to operate until the level raises above the back-up high-level float, at which point the GST fill process shall stop.

3.12 HSP DISTRIBUTION PUMPING SYSTEM CONTROL DESCRIPTION

A. Influent Pressure Transmitter (PIT-500)

1. HSP distribution pumping system will include an influent pressure transmitter.
2. The pressure transmitter will report the influent pressure for the High Service Pumps to PCP-1 and the SCADA Network.
3. The HMI on PCP-1 shall display the following:

a. Instantaneous Pressure of the discharge line.
b. High Pressure Alarm
c. Low Pressure Alarm

4. The CONTRACTOR shall set the pressure alarms in the field at the direction of the OWNER and ENGINEER.

B. Discharge Pressure Transmitter (PIT-550)

1. The plant discharge station will include a pressure transmitter.
2. The pressure transmitter will report the discharge pressure for the High Service Pumps to PCP-1 and the SCADA Network.
3. The HMI on PCP-1 shall display the following:

a. Instantaneous Pressure of the discharge line.
b. High Pressure Alarm
c. Low Pressure Alarm

4. The CONTRACTOR shall set the pressure alarms in the field at the direction of the OWNER and ENGINEER.

C. Flow meter (FIT-550)

1. The plant discharge station will include a new flow meter.

2. The flow transmitter will report the discharge flow rate for the High Service Pumps to PCP-1 and the SCADA Network.
3. The HMI on PCP-1 shall display the following:
    a. Instantaneous flow of the discharge line.
    b. Totalized flow for the current day
    c. Totalized flow for the current month
4. The Control System shall trend and historize the totalized flow.

D. High Service Pumps (P-510 (Relocated), P-520, P-530, P-540)
1. The HSP distribution pumping system will consist of three new and one relocated VFD driven high service pumps to discharge water from the GSTs into the WTP service area.
2. PCP-1 and SCADA Network shall monitor and control the status of the pumps.
3. PCP-1 and SCADA Network shall monitor the status of pump faults and availability of the pumps.

E. Variable Frequency Drives (VFD-510 (Relocated), VFD-520 (Relocated), VFD-530, VFD-540)
1. The HSP distribution pumping system will include two new and two relocated VFDs.
2. PCP-1 and SCADA Network shall monitor and control the status of the VFDs.
3. PCP-1 and SCADA Network shall monitor the status of VFD faults and availability of the VFDs.
4. PCP-1 and SCADA Network shall monitor and control the speed of each pump.
    a. Pump speed shall be reported in % speed and Hz.
    b. The Control System shall trend and historize the pump speeds over the past 12 months. In the trending area of the HMI, the control system shall allow the operator to trend pump speeds for a selectable period of up to 12 months.
5. PCP-1 and SCADA Network shall monitor the run times for each pump.
    a. Run times shall be reported in whole hours.
    b. The Control System shall trend and historize the totalized pump run time over the past 12 months. In the trending area of the HMI, the control system shall allow the operator to trend totalized pump run times for a selectable period of up to 12 months.
    c. A password protected pump run time reset button shall be provided on the HMI.
6. For the VFDs, the HMI shall display the following:
    a. Remote/Local Status
    b. Run Status
    c. Fault Status
    d. Speed Command
    e. Speed Reply
    f. Pump Run Time

7. The Operator shall be able to send a remote reset signal from PCP-1 and SCADA Network.
8. Interlocks
    a. The control system shall interlock the pumps and prevent running under the following conditions with a password protected override for each:
        i. GST Low Level Alarms
        ii. High Motor Thermal
        iii. Remote Stop Switch
9. When in remote mode, the VFDs shall operate the pumps in accordance with the narrative below.

F. For further details on the field devices, refer to the project drawings.

G. High Service Pump Operation
1. The HSP distribution pumping system consists of four VFD driven high service pumps.
2. The pumps shall operate in a 3 duty + 1 standby configuration (lead/ lag 1/ lag 2/ standby). The plant control system shall rotate duty and standby pumps every 24 hours as follows:
    a. The pump with the lowest accumulated run time shall be designated as the Lead pump.
    b. The pumps with the next lowest accumulated run times shall be designated as Lag 1 and Lag 2 pumps.
    c. The pump with the highest accumulated run time shall be designated as the Standby pump.
3. Remote Operation to maintain discharge pressure:
    a. The operator shall enter the pressure setpoints described for the system's pressure transmitter (PIT-550).
    b. Falling Pressure: As the pressure falls below the Start Pressure set point, the control system shall start the lead pump. The pump shall ramp to max speed and a PID loop shall be used to vary the pump speed between the maximum and minimum speed to achieve the Desired Pressure set point. The maximum and minimum speed shall be coordinated with the pump manufactures.
        i. As the pressure continues to drop and again reaches the Start Pressure set point for an adjustable period of time (60 seconds initial), the control system shall start Lag Pump 1. This step shall be repeated until all duty pumps are running.
        ii. When multiple pumps are running, the control system shall run those pumps at the same speed.
    c. Rising Pressure: As the pressure rises above the Stop Pressure set point and the lead Pump has been at minimum pump speed for an adjustable period of time (60 seconds initial) the control system shall shutdown a pump.

i. If multiple pumps are running, the pump with the highest run time shall be shutdown first.

ii. This step shall be repeated until all pumps are off.

d. Pressure set points are as follows:

Description	**Setpoint/ Range**
Start Pressure	60 PSI
Stop Pressure	80 PSI

3.13 AUXILLARY FUNCTIONAL CONTROL DESCRIPTIONS

A. Standby generator systems

1. The plant will be connected to a standby diesel generator system.
2. All diesel generator annunciation and control functions shall transmit to the SCADA Network system through the generator control panel GCP-1 as indicated on the Drawings.

B. Automatic Transfer Switch

1. The plant will also contain an Automatic Transfer Switch (ATS) that shall indicate to PCP-1 and the SCADA Network the following:
   a. ATS in Emergency position,
   b. ATS in Normal Power position,
   c. Normal Power Available,
   d. Emergency Power Available,
   e. Emergency Power Fault
2. For further details on the ATS, refer to the project drawings.

C. SCADA

1. The Water Treatment Plant Control System shall output digital and analog information to the SCADA Network System. The signals will be the same information displayed on the HMI in a digital or analog format.
2. Full functional control shall be available remotely through the SCADA Network System.
3. SCADA Network annunciation and control shall be accomplished via SJCUD cooperate network.

END OF SECTION 16930

SECTION 16950

FIELD INSTRUMENTS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Requirements for the installation, and general integration of primary measurement devices, sensors and instrumentation into the Plant Control and SCADA systems.

2. Requirements for the purchase, tagging, scaling and configuration of primary measurement devices and process instrumentation

B. Related Sections: Division 16.

1.03 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base air ratings on sea-level conditions.

B. Operating Temperature: 0 degrees F to 100 degrees F.

C. Environment: Reclaimed Water.

1.04 SUBMITTALS

A. Submit shop drawings.

B. Product Data including rated capacities of each unit, weights (shipping, installed, and operating), furnished specialties, accessories, and the following:

1. Sensor housing, NEMA rating.

2. Power requirements.

3. Sensitivity ranges.

4. Mounting requirements.

C. Shop Drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connections.

D. Coordination Drawings, including plumbing/connection plans and sections drawn accurately to scale. Submit with Shop Drawings. Show layout and relationships between components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support. Indicate and certify field measurements.

E. Wiring diagrams detailing wiring for power and control systems and differentiating clearly between manufacturer-installed and field-installed wiring.

1.05 QUALITY ASSURANCE

A. Electrical Component Standard: provide components that comply with NFPA 70 and that are listed and labeled by UL where available.

B. Each instrument shall provide direct programming capability through the PLC

C. Each instrument shall be supported with a device profile permitting direct integration in the PLC

D. The ENGINEER or the ENGINEERS appointed Representative shall witness all instrument verifications in the field.

E. The Manufacturer field service representative shall verify installation of all installed sensors, cables and transmitters.

F. Manufacturer representative shall notify the ENGINEER in writing of any problems/discrepancies and proposed solutions within 24 hours of discovery. (The ENGINEER shall be the sole party responsible for determining the corrective measures).

G. Manufacturer representative shall generate a configuration report for each sensor and transmitter installation

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver units as factory-assembled units, to the extent allowable by shipping limitations, with protective crating and covering.

B. Lift and support units with the manufacturer’s designated lifting and covering.

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field measurements. Verify clearances for installation.

1.08 COORDINATION AND SCHEDULING

A. Coordinate with the ENGINEER for the mounting locations of each instrument prior to installation.

1.09 SPARE PARTS

A. Furnish any spare parts that are expected to be replaced within a 1-year period in sufficient quantity to keep monitoring equipment operating for a minimum period of one year.

1.10 WARRANTY

A. All equipment supplied under this section shall be warranted for a period of one (1) year by the MANUFACTURER from substantial completion.

B. The equipment shall be warranted to be free from defects in workmanship, design and materials. If any part of the equipment should fail during the warranty period, it shall be replaced in the machine(s) and the unit(s) restored to service at no expense to the OWNER.

C. The MANUFACTURER'S warranty period shall run concurrently with the CONTRACTOR'S warranty period. No exception to this provision shall be allowed.

PART 2 – PRODUCTS

2.01 GENERAL

A. Provide instruments and primary measurement devices as indicated in the design drawings.

B. Refer to design drawings and for instrument locations and installation details.

1. Refer to P&ID's or plans for relevant locations and systems
2. Refer to plan drawings for instrument, RTU, and control panel locations

C. All Instruments with Analog signals (4-20 mA) shall be configured so that in a fault or failure condition, a signal current of less than 3.8 mA will be transmitted.

2.02 FLOW

A. Magnetic Flow Meters

1. The flowmeter shall be (Product) as manufactured by:
   a. Siemens FMS500 with FMT020
   b. or approved equal
2. The magnetic flowmeter shall be a pulsed DC volumetric liquid flow rate detector. Coils shall be excited with pulsed DC current. The electronics portion of the magnetic flowmeter shall include both a magnet driver to power the magnet coils and a signal converter. The output signal shall be directly proportional to the liquid flow rate.
3. The metering spool shall have flanged process connections. The metering tube shall be constructed of lined stainless steel (304 SST). The liner shall be manufactured of materials compatible with the service intended. The sensor shall be fitted with measuring and empty pipe electrodes. Flanged meters shall be equipped with grounding electrodes.
4. The flow tube shall be rated IP68 (NEMA 6P).
5. The signal converter shall be microprocessor based and shall perform internal diagnostics of the transmitter condition. The signal converter shall be capable of measuring flow in both the forward and reverse directions. The signal converter shall have a local display and shall indicate flow in engineering units. The signal converter shall output a standard 4 to 20 mA analog signal proportional to flow. The signal converter shall include a local flow totalizer. The signal converter shall utilize 115 VAC supply power. The converter enclosure shall be rated NEMA 4X.
6. The standard accuracy of the metering system shall be 0.25% of reading or better. The meter shall be accurate throughout the anticipated flow range of the meter.

7. The sensor and signal converter shall be supplied from the same manufacturer and shall be supplied with all interconnecting cables and other fixtures as required.
8. The flow sensor shall be supplied with 316 stainless steel grounding rings.
9. The flow transmitters shall be provided with local analog signal surge suppressors for lightning protection.

2.03 PRESSURE

A. Line Pressure Transmitters

1. Pressures shall be monitored with the following product Pressure Transmitter:

   a. Vegabar 82
   b. or approved equivalent.

2. The transmitter shall be a 2-wire, high-performance piezoresistive pressure transmitter with digital communications capabilities including HART, Profibus PA or Foundation Fieldbus as required by the plans.
3. Measure millivolt changes in the sensor as pressure varies and produces a linear 4-20mA DC output proportional to the pressure. The unit shall have self-diagnostic capability and a non-volatile memory; Histo-ROM memory module for monitoring of events, configuration changes and periodic recording of temperature/pressure values.
4. Display shall be an integrally mounted 4-line LCD scaled with engineering units.
5. Transmitter shall have a static pressure limit at least 1.5 times the nominal pressure range. Unit shall use DC loop-power supply 10.5 to 45 VDC with self-diagnostic capability and a non-volatile memory.
6. Sensor shall be a piezoresistive, oil-filled element with metal process diaphragm.
7. The unit shall be rated for process temperature of minus 13°F to 257°F and an ambient environment of minus 50 degrees F to 185 degrees F.
8. Reference accuracy shall be +/- .075% of calibrated span including non-linearity hysteresis and non-reproducibility in accordance with IEC 60770. Total performance accuracy including non-linearity hysteresis and non-reproducibility in addition to thermal change of the zero point shall be +/- .2% URL.
9. The transmitter shall be programmable via Hall magnetic switch external pushbuttons without pressure source or handheld device.

   Unit shall have ATEX, FM, CSA or IECEx approvals as required

2.04 LEVEL

A. Direct Acting Float Switches

1. Direct Acting Float devices are to be mounted vertically and shall be suspended from a weighted stainless-steel cable.
2. The direct acting float switch as manufactured by:

a. Flygt PSM ,
b. or approved equivalent.

3. Provide 316 stainless steel cable grips with 316 stainless steel hooks to support the level switches.
4. The level switches shall be suspended from a stainless-steel bracket mounted in the clear well. The bracket shall be located above the water level near the access hatch and ladder to facilitate access for maintenance. The mounting bracket shall be accessible from the hatch and ladder.
5. Final locations (Depth or Elevation) of the submersible level switches may change during startup. The Vendor shall install submersible level switches such that the elevation of the transmitter is adjustable.

B. Free Space Radar Level Transmitters

1. Subject to compliance requirements, provide unites by one of the following:

a. Vegapuls 31
b. Or approved equal

2. The pulsed time of flight radar transmitter shall operate at 26 GHz using 2-wire technology for level measurement and/or open channel flow measurement.
3. Accuracy shall be and +/- 0.08”
4. Maximum measurement distance shall be 0- 66 ft.
5. The radar shall have CSA C/US General purpose approvals as required.
6. Process Temperature range is -40 to 176 degrees F and pressure range is from -14.5 to 43 psi.
7. The process connection shall be 1” NPT, 1.5” NPT, 2” NTP
8. The radar output signal shall be 4-20 mA dc loop powered.
9. The radar device shall have Bluetooth wireless technology interface and can be operated and configured via this interface using a mobile device application. The range under reference conditions is 33ft. The Bluetooth shall have both encrypted communication and password encryption for security purposes. The Bluetooth wireless technology interface can be deactivated.
10. The radar signal on alarm shall be 22.5 mA
11. The radar unit shall be rated for and IP68, NEMA 6P.
12. The radar sensor body material shall be made of PVDF
13. The radar sensor must have hermetically sealed wiring and fully potted electronics eliminating water ingress.

PART 3 – EXECUTION

3.01 TRAINING

A. Train OWNER’s maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventative maintenance.

B. Demonstrate operation of products specified in this Section. Conduct walking tour of the Project. Briefly identify location and describe function, operation, and maintenance of each product.

3.02 INSTALLATION

A. Install according to manufacturer's written instructions.

B. Install units with clearances for service and maintenance.

C. Each pump shall be provided with a suction and refer to the mechanical details for pressure gauge installation requirements discharge pressure gauge.

D. All pressure transmitters shall be installed using a stainless-steel isolation valve and stainless-steel pipe nipple. Provide a stainless-steel diaphragm seal for each pressure transmitter.

E. All transmitters shall be provided with sun/rain hoods.

F. Field instruments shall be factory calibrated and delivered to project site with certificates. Contractor shall coordinate process ranges in the field and document as-built I/O list with calibrated process ranges for turnover to the Owner.

G. Equipment shall be installed as shown on the Drawings and in accordance with the approved shop drawings and equipment manufacturer's installation instructions.

H. Wiring shall be installed as shown on the schematics or loop diagrams and in accor¬dance with Division 16 – Electrical and design drawings, to obtain a completely functional control system.

3.03 CONNECTIONS

A. Electrical: Conform to applicable requirements in Division 16 Sections.

B. Grounding: Ground equipment. Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.04 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Provide services of a factory-authorized service representative to supervise the field assembly of components and installation and electrical connections, and to report results in writing.

B. CONTRACTOR shall install all equipment and related accessories before having the manufacturer's field service. If additional trips are required due to incorrect installation, CONTRACTOR shall pay for the costs for the field services.

3.05 START-UP SERVICE

A. The systems integrator shall provide field services for as many days as necessary to test, calibrate, troubleshoot, and place into satisfactory service the entire instrumentation system.

B. Once the system is operational, the systems integrator shall provide onsite instruction and training services to the OWNER’s personnel as detailed in these specifications.

C. The services of a qualified representative from each manufacturer shall be pro-vided to inspect the completed equipment installation, make all adjustments necessary to place the system in trouble free operation and instruct the operating personnel in the proper care and operation of the equipment furnished. Every instrument is to be calibrated to its manufacturer's stated accuracy.

D. All necessary tools, test instruments or other devices required to perform a three-point calibration for each instrument are to be provided by the manufacturer's representative.

E. Field calibration shall be supervised by the project coordinator and witnessed by the Design Builder or his representative. A minimum of two days advanced notice of such calibration shall be given to the Design Builder.

F. The supervision of equipment start-up and the instruction of the Town of Mayo personnel in operation of the instrumentation and controls shall be performed by factory trained representatives of the equipment manufacturers.

G. After the system is operating satisfactorily, the performance shall be demonstrated to the satisfaction of the Town of Mayo, who will be the judge of its acceptability.

H. Cost of providing manufacturers service representative for start-up and for training plant personnel shall be borne by the Vendor and is included in the Contract Price. No time or trip limitations shall be placed on these services.

3.06 TESTING

A. Perform testing, commissioning and startup as defined in the associated scope of work section.

END OF SECTION 16950

SECTION 16991

FACTORY ACCEPTANCE TESTING (FAT)

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. A FAT shall be performed after the system is manufactured and configured prior to shipment to the site. The CSI shall provide labor, tools, material, and equipment for performing the factory acceptance tests on the system.

B. The CONTRACTOR shall be responsible for coordinating the FAT of the proposed control system with all involved parties including OWNER, ENGINEER, control panel supplier, control system integrator, and other equipment vendors as applicable.

C. The control system integrator (CSI) shall provide detailed FAT protocol documents prior to the commencement of FAT. FAT protocol documents shall include test plan, schedule, and document to record punch list items.

D. Protocol documents for testing equipment and functionality shall include but not be limited to:

1. All pump system control equipment.
2. PLC control function for all system control equipment.
3. PLC interface with other systems.
4. Communication equipment configuration and operation.
5. OIT graphic displays.

E. FAT testing shall include all equipment and control panels fabricated in accordance with the project requirements.

1.03 CITED STANDARDS

A. National Fire Protection Association (NFPA):

1. 70, National Electrical Code (NEC).
2. 70E Standard for Electrical Safety in the Workplace 2012.

B. The Institute of Electrical and Electronics Engineers (IEEE).

C. International Society of Automation (ISA).

1.04 NOTED RESTRICTIONS

A. The factory test shall not begin until all related control system and shop drawings have been submitted and approved.

B. All systems, panels, and equipment required for factory acceptance testing are specified in this section.

1.05 QUALITY CONTROL

A. The Integrator shall generate the FAT protocol document.

B. The FAT protocol shall be submitted and approved by the ENGINEER.

C. The Integrator shall certify to the ENGINEER that the entire control system is ready for testing prior to the initiation of the FAT.

D. The factory test shall be declared a failure and a retest shall be required if any of the following were to occur:

1. Failure to meet the requirements of the operational testing of the system as specified in this Section.

2. Failure to meet the acceptance criteria as established in the approved Factory Acceptance Test Procedures.

1.06 SUBMITTALS

A. All submittals shall be provided in accordance with Section 01300.

B. The Integrator shall submit information on the factory testing facility and procedures to verify that testing shall fulfill the requirements as specified herein. Submittal shall be made at least 21 calendar days in advance of any scheduled testing and shall include dates of scheduled tests.

C. The control system integrator shall submit Factory Acceptance Test (FAT) Protocols for each item listed in this document.

D. The approved testing protocols shall be used for recording the test results during the FAT.

E. Factory Acceptance Test protocol documents shall include but not necessarily be limited to the following:

1. Detailed description of system to be tested.

2. Overall scope of testing and acceptance criteria for:

a. Control Panels

i. Visual inspection, dimension, access for maintenance.

ii. Bill of material verification.

iii. Manufacturer’s documentation.

iv. Recommended spare parts list and spares.

v. Tagging of components.

vi. Warning labels, if applicable.

b. Wiring

i. Visual inspection for cable entry, routing, support.

ii. Termination.

iii. Segregation by voltages/type.

iv. Review of vendor's reports of tests and checks, if applicable.

c. Software Licenses and Version including firmware.
d. Control Logic – Functional capability, demonstrated to the satisfaction of the Engineer.
e. Discrete I/O.
f. Analog I/O.
g. Hard-wired Interlocks.
h. PLC logic Interlocks.
i. Alarms.
j. Graphics – Operator interface capability.
k. Tag numbers and database.
l. Communication equipment and configuration.
m. Communication performance.
n. Control system Interface with other systems.
o. Non-standard operating conditions.

i. Loss of power for each component.

ii. Communications failure.

iii. Removal of each PLC card.

iv. PLC failure.

3. Factory Acceptance Test Schedule

a. The CSI and OWNER shall mutually agree upon the test schedule based on project schedule and when the system should be delivered to the site.
b. The ENGINEER and OWNER shall be present for the FAT. A minimum of 2 weeks' notice shall be provided to allow them to attend.
c. The CSI shall include a minimum of five working days in the schedule for FAT.

4. Factory Acceptance Test Punch List

a. Any incomplete work or non-conformances detected during FAT shall be recorded on FAT punch list. Punch list items shall be categorized as follows:

i. Immediate: FAT shall be paused for rectification and FAT shall continue after rectification.

ii. On-going: Rectification during FAT and will be completely rectified at the end of FAT. This category is used typically for multiple instances of the same issue which will be rectified during FAT as the issues are encountered.

iii. Repeat: FAT should be repeated after rectification and before completion of FAT.

iv. Before Ship: Issue to be rectified after FAT but before item is shipped to site. Re-test, if required should be documented and conducted during SAT.

v. At Site: Remaining work to be rectified after shipment. Re-test. If required to be conducted during SAT.

vi. Future: Issues that are beyond the scope of the project but something that should be addressed in the future.

5. FAT Punch List at a minimum shall include:
   a. Reference to applicable FAT test plan requirement.
   b. Description of the issue.
   c. Person responsible for resolution.
   d. Description of the resolution and date completed.
6. Corrections and Re-test
   a. Any changes made during FAT that may affect previously completed tests require that those tests be re-performed and documented.
7. Correction after FAT
   a. All problem corrections and subsequent re-check should be executed during the FAT. If this is not possible then rectification can be undertaken after the FAT, if mutually agreed to by the OWNER and CONTRACTOR. Problem correction after the FAT should include the following:
      i. Identification of re-work needed.
      ii. Action plan/time schedule.
      iii. Person responsible for completing task.
      iv. Execution of re-work.
      v. Re-test of anything affected by the re-work. Need for OWNER witness of re-test to be agreed upon with CONTRACTOR.
      vi. Notification of completion.
      vii. Acceptance of re-check.
8. Documentation of FAT
   a. FAT Report including:
      i. Attendees.
      ii. Tests performed.
      iii. Open issues and agreements for their resolution.
      iv. OWNER approval to ship or other disposition of the system.
   b. FAT Documentation including:
      i. Signed copies of test function plans.
      ii. Date and sign all documents generated during FAT.
      iii. FAT punch list with status of each item.
      iv. Document the actual hardware and software (including versions) tested.
      v. Document all configurable parameters used for testing.
      vi. Backup copies of the final complete system and software.

vii. Color copies of all applicable graphic displays.

viii. Update of all system-related documentation to reflect the FAT complete status of the system.

F. The CSI shall submit completed and signed FAT report and documentation to the ENGINEER within 5 days of completion of the FAT. The protocols, reports and documentation shall be submitted electronically in PDF format.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 CONTROL SYSTEM

A. The proposed control system at the FAT shall use simulated equipment, simulation code, and emulators where necessary for successfully testing functional capabilities of the system.

B. The CSI shall verify throughout the FAT procedure that the functionality of the entire system is in accordance with the operational requirements as established in the contract documents and the approved detailed design.

C. Factory Acceptance Test Completion

1. FAT shall be considered complete when all the required functions have been demonstrated and verified to be in accordance with the FAT plan and specifications. Upon successful completion of the FAT procedure, the CSI shall sign the test results/report. FAT report and documentation shall be delivered to the ENGINEER. The CSI shall be granted permission to ship the system and equipment to the field site after the completion of FAT.

D. The location for the FAT shall be facilitated by the CSI for as long as it is needed to successfully complete the entire FAT and resolve all encountered deficiencies to the satisfaction of the ENGINEER and the OWNER.

E. All interconnections shall be on the same type of media as proposed for the final installation. Shorter runs are acceptable.

F. All tag numbers, description of tags, I/O addresses for PLC and for SCADA shall be fully configured prior to FAT and tested during FAT.

G. Safety

1. All testing shall be done in accordance with NFPA 70E.

3.02 MINIMUM STAFFING

A. The CSI shall provide the following minimum staffing available during the FAT:

1. Control Systems Integrator – Project Manager or Lead Engineer/Programmer

2. 1 - PLC/HMI Programmer

END OF SECTION 16991

SECTION 16992

COMMISSIONING

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Requirements for the CONTRACTOR to provide commissioning and installation services.

B. Requirements for the CONTRACTOR to provide labor, materials, tools, and testing equipment to commission controls, networking, and communications related equipment and systems.

C. Requirements for the CONTRACTOR to perform associated testing of electrical systems, wiring, equipment, and grounding.

1.03 CITED STANDARDS

A. National Fire Protection Association (NFPA):

1. 70, National Electrical Code (NEC).
2. 70E Standard for Electrical Safety in the Workplace 2012.

B. The Institute of Electrical and Electronics Engineers (IEEE).

C. International Society of Automation (ISA).

1.04 NOTED RESTRICTIONS

A. Commissioning of any system shall not begin until permission is granted by the ENGINEER and OWNER.

B. Comply with NFPA 70E.

C. The OWNER shall have the option to witness and participate in the entire commissioning and integration process.

1.05 QUALITY CONTROL

A. The Integrator shall submit weekly and monthly commissioning progress reports to the ENGINEER. The report formats shall be developed by the Integrator.

B. Test Equipment Traceability:

1. The Integrator shall have a calibration program which maintains applicable test instrumentation and equipment within rated accuracy and within their calibration time limits.
2. Equipment and instruments used to evaluate electrical performance shall be calibrated to a secondary standard traceable to the National Institute of Standards and Technology (NIST).

3. Test equipment operating instructions and procedures shall be with the test equipment.
4. A copy of test equipment calibration certificate or calibration sticker must be with equipment at all times to be available for inspection.

1.06 SUBMITTALS

A. The following submittals shall be made during commissioning:
   1. Progress reports.
B. A commissioning report shall be submitted upon the completion of commissioning activities to notify the OWNER and ENGINEER of the milestone and the readiness for Site Acceptance Testing (SAT). The commissioning report shall include, but not be limited to, the following:
   1. Completed commissioning checklists.
   2. Completed punch lists.
   3. Calibration data sheets.
   4. Drawings and manuals.
   5. Training.

PART 2 – PRODUCTS

2.01 GENERAL

A. Where equipment is to be retained but rewired that equipment and associated wiring shall be subjected to testing new equipment and wiring procedures.
B. The start-up service personnel must follow job site electrical safety requirements, installation standards and electrical testing standards. Adhere to OSHA safety practices for the entirety of commissioning.
C. OWNER designated representatives may witness all integrated system commissioning activities.
D. In addition to the requirements of this section, the installation and commissioning will comply with all applicable requirements of the RFP.

2.02 PRODUCT NAME

A. A partial list of systems and equipment to be commissioned shall include but not limited to:
   1. Panel devices.
   2. All modifications and associated devices.
   3. PLC.
   4. OIT.
   5. Communication equipment.

6. Remote Access for pump station monitoring data.
7. Graphic Displays in OIT.

PART 3 – EXECUTION

3.01 GENERAL

A. The commissioning and installation shall be considered complete by the ENGINEER upon successful installation of control equipment and execution of the commissioning requirements listed herein. The Integrator shall be granted permission to begin the Site Acceptance Testing.

B. CONTRACTOR shall be responsible for any damage to equipment or material due to improper testing or commissioning and shall replace or restore to original condition any damaged equipment or material.

C. All systems, equipment, and rooms shall be commissioned in a complete manner as possible to ensure a complete working control system, network, and communication system.

D. The intent of commissioning is to start-up equipment or systems and prepare them for performance site acceptance testing. Care should be taken to ensure continuous and reliable operation of the booster pumping station systems at all times.

E. Commissioning of all systems listed to include but not be limited to:

1. All wire, cable, equipment, and systems installed or connected under control systems upgrade contract shall be tested to assure proper installation, setting, connection, and functioning in accordance with the drawings, specifications, and the manufacturer's recommendations. The intent herein is that field testing be extensive and complete as specified, to provide assurance of correct installation and operation of equipment.

2. All tests and inspections recommended by the equipment manufacturer shall be included, whether required by these specifications or not, unless specifically waived in writing by the ENGINEER.

3.02 COMMISSIONING AND SYSTEM INTEGRATION

A. Commissioning shall be performed with all inter-related systems operating. In general, integrated system commissioning shall be operated through all modes of operation (normal, emergency, interruption to the incoming services, manual operations). Verification of each mode in the sequences of operation is required.

B. If a problem is detected while conducting commissioning, the problem will be identified and reported to the CONTRACTOR for diagnosis and correction. The failed portion shall be repeated after the repairs are completed.

C. A combination punch list/checklist shall be maintained by the Integrator in spreadsheet format to monitor and track equipment commissioning and installation. The spreadsheet shall be an integral part of the weekly report documentation and must be included with final report.

3.03 CERTIFICATION

A. Notification of Completion of Work

1. Prior to acceptance of Work, the OWNER shall request from the CONTRACTOR a written notification certifying that:

a. Work has been completed in accordance with Contract Documents.
b. Work has been inspected for compliance with Contract Documents.
c. Work is ready for final inspection and site acceptance testing.

B. Final Walk-Thru

1. After receipt of the notification of completion of work, the ENGINEER or Project Manager will conduct a final walk-thru with the participation of the OWNER, CONTRACTOR, ENGINEER and other appropriate project team members to verify the status of the completion.

C. Final Punch List

1. Should the ENGINEER consider that the Work is incomplete or defective:

a. The OWNER will notify the CONTRACTOR in writing, by form of a final punch list, listing the incomplete or defective Work.
b. The CONTRACTOR will take immediate steps to remedy the stated deficiencies and send a second or subsequent written certification to the ENGINEER stating that the Work is complete.
c. The ENGINEER or Project Manager will re-inspect the Work.

2. Upon satisfaction that all the work is complete and all items in the Final Punch List addressed to the satisfaction of the ENGINEER, the OWNER and CONTRACTOR will sign-off on the final punch list indicating concurrence that the work is complete.

D. Manuals and Records

1. After final walk-thru and sign-off on the final punch list have been achieved the CONTRACTOR releases to the OWNER the following manuals and records kept, updated and/or developed during the project:

2. Final documentation as specified in Section 16900.

3. Training session forms.

4. Copies of all punch lists.

3.04 TRAINING

A. After the completion of commissioning and installation, designated OWNER personnel shall be trained in the operation and maintenance of all equipment and systems related to the project.

B. Training shall consist of a formal one-day session wherein all procedures necessary to operate and maintain equipment and systems on a continuing basis are explained in full detail. Hands-on operations and maintenance tasks shall be executed to ensure that all aspects of the training are fully understood.

C. Training shall be conducted on-site by the CSI and shall be offered to accommodate up to 12 persons.

D. Training times shall be determined and coordinated by the OWNER.

END OF SECTION 16992

SECTION 16993

SITE ACCEPTANCE TEST (SAT)

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Site acceptance tests shall be performed after the system is delivered, installed and commissioned at the site. SAT shall demonstrate proper installation and functionality of the system after delivery and installation at the site.

B. The CONTRACTOR shall coordinate SAT testing with all involved parties including OWNER, ENGINEER, and Control System Integrator for all labor, tools, material, and testing equipment to perform and document SAT.

C. The CONTRACTOR shall submit SAT protocol documents prior to the commencement of SAT. SAT protocol documents shall include:

1. SAT plan
2. SAT test schedule
3. Document for recording punch list items

D. SAT plan shall include but not limit testing of the following systems:

1. All booster/pumping system control equipment
2. All sodium hypochlorite system control equipment
3. PLC control logic for booster/pumping equipment
4. PLC interface with other systems
5. Communication equipment configuration and operation.
6. OIT graphic displays
7. All generator system control equipment

1.03 CITED STANDARDS

A. National Fire Protection Association (NFPA):

1. 70, National Electrical Code (NEC)
2. 70E Standard for Electrical Safety in the Workplace 2012

B. The Institute of Electrical and Electronics ENGINEERs (IEEE)

C. International Society of Automation (ISA)

1.04 NOTED RESTRICTIONS

A. Site Acceptance Testing shall not begin until permission is granted by the ENGINEER and Owner.

B. Comply with NFPA 70E.

C. The Owner shall have the option to witness and participate in the entire site acceptance testing process.

1.05 QUALITY CONTROL

A. The Control System Integrator shall generate the Site Acceptance Test (SAT) protocol document.

B. The SAT protocol shall be based on a revised FAT protocol document to ensure consistency and efficiency.

C. The SAT procedures shall be submitted and approved by the OWNER and ENGINEER prior to the commencement of SAT.

D. The Control System Integrator shall certify to the ENGINEER that the entire control system that are being installed under the control system upgrade are ready for the SAT prior to the initiation of the SAT.

E. The SAT shall be declared a failure and a retest shall be required if any of the following occur:

1. Failure to meet the requirements of system hardware operational testing as specified in this Section.

2. Failure to meet the acceptance criteria as established in the approved Site Acceptance Test Procedures.

F. Prove-In Period

1. The SAT shall be concluded with a 30 day “prove-in” period to allow time for any errors or omissions in the integration work to be revealed.

2. The CONTRACTOR shall correct any errors revealed in the “prove-in” period at no cost to the Owner and as part of the warranty requirements.

1.06 SUBMITTALS

A. The CSI shall submit the detailed SAT plan to the ENGINEER, to include but not limit testing for:

1. Control Panels

a. Visual inspection, dimension, access for maintenance
b. Bill of material verification.
c. Manufacturer’s documentation: Data sheets, User’s Manual, etc..
d. Recommended spare parts list.
e. Spare parts received.
f. Labelling of components.
g. Warning labels, if applicable.
h. Wiring:

i. Visual inspection for cable entry, routing, support.

ii. Termination.

iii. Segregation by voltages/type.

iv. Review of vendor's reports of tests and checks, if applicable.

2. Software licenses and version including firmware received and installed.
   a. System Energization:
      i. Initialization of controller(s).
      ii. Software download.
      iii. Diagnostic checks.
3. Hardware Redundancy and Diagnostics, if applicable.
   a. OIT:
      i. Check latest version of graphics are installed.
4. Control Logic:
   a. Check latest revision is installed.
5. Discrete I/O.
6. Analog I/O.
7. Hard-wired Interlocks.
8. PLC logic Interlocks.
9. Alarms.
10. Graphics – Operator interface capability.
11. Tag numbers and database.
12. Communication equipment and configuration.
    a. Communication performance.
13. Control system interface to other systems.
14. Non-standard operating conditions shall be tested.
    a. Loss of power for each component.
    b. Communications failure.
    c. Removal of each PLC card.
    d. PLC failure.

B. SAT SCHEDULE

1. The CSI shall develop a schedule for performing Site Acceptance Tests based on project schedule.

C. Site Acceptance Test Punch List

1. Any incomplete work or non-conformances detected during SAT shall be recorded on SAT Punch List. Punch list items shall be categorized as follows:
   a. Immediate: SAT shall be paused for rectification and SAT shall continue after rectification.

b. On-going: Rectification during SAT and will be completely rectified at the end of SAT. This category is used typically for multiple instances of the same issue which will be rectified during FAT as the issues are encountered.
c. Repeat: SAT should be repeated after rectification and before completion of SAT.
d. Future: Issues that are beyond the scope of the project but something that should be addressed in the future.

2. Fat Punch List at a minimum shall include:

   a. Reference to applicable FAT Test Plan requirement.
   b. Description of the issue.
   c. Person responsible for resolution.
   d. Description of the resolution and date completed.

3. Corrections.

   a. Any changes made during SAT during rectification of punch list items, shall be documented. Any changes that may affect previously completed tests require that those tests be re-performed and documented.

4. Correction after SAT.

   a. All problem corrections and subsequent re-check should be executed during SAT. If this is not possible then rectification can be undertaken after the SAT, if mutually agreed to by the Owner and CONTRACTOR. Problem correction after the SAT should include the following:

      i. Identification of re-work needed.

      ii. Action plan/time schedule.

      iii. Person responsible for completing task.

      iv. Execution of re-work.

      v. Re-test of anything affected by the re-work. Need for owner witness of re-test to be agreed upon with CONTRACTOR.

      vi. Notification of completion.

      vii. Acceptance of re-test.

5. Documentation of the SAT.

   a. SAT Report including:

      i. Attendees.

      ii. Tests performed.

      iii. Open issues and agreements for their resolution.

      iv. Owner acceptance of the system.

   b. SAT Documentation including:

      i. Signed copies of test function plans.

      ii. Date and sign all documents generated during SAT.

iii. SAT punch list with latest status of each item.

iv. Document the hardware and software (including versions) tested.

v. Document all configurable parameters used for testing.

vi. Backup copies of the final complete system and software.

vii. Document system loading observed during the test and spare capacity.

viii. Provide an index and color graphics of any displays modified or added during SAT.

ix. Update of all system-related documentation to reflect the SAT complete status.

6. SAT Completion

a. SAT shall be considered complete when all of the required functions have been demonstrated and verified to be in accordance with the SAT plan and specifications. Upon successful completion of the SAT procedure, the CSI shall sign the test results/report. SAT report and documentation shall be delivered to the owner/ENGINEER.

D. The SAT protocols shall be submitted a minimum of 14 days prior to anticipated testing start date.

E. Site acceptance test procedures document shall include all the tests included in the FAT test protocol requirements defined in Section 16991.

F. Only approved protocols shall be used for recording the test results during the SAT. The test protocols shall include pass/fail criteria and spaces for the ENGINEER and CONTRACTOR/Integrator sign-off.

G. The Integrator shall submit completed and signed SAT report and documents to the ENGINEER/Owner within 5 days of completion of the SAT. The report and documents shall be submitted electronically in PDF format.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 CONTROL SYSTEM

A. The CONTRACTOR and the CSI shall be responsible for coordinating the SAT of the proposed control system.

B. The Control System Integrator shall verify, throughout the site acceptance test, that the functionalities of all systems under this contract are in accordance with the operational requirements as established in the Contract Documents and the approved Detailed Design.

C. SAT shall be considered complete when all of the required functions have been demonstrated and verified to be in accordance with the SAT plan and specifications. Upon successful completion of the SAT procedure, the CSI shall sign the test results/report. SAT report and documentation shall be delivered to the ENGINEER.

D. Prove-In Period

1. The SAT shall be concluded with a 30 day “prove-in” period to allow time for any errors or omissions in the integration work to be revealed.
2. The CONTRACTOR shall correct any errors revealed in the “prove-in” period at no cost to the Owner and as part of the warranty requirements specified in Section 16900.

E. Safety

1. All testing shall be done in accordance with NFPA 70E.

3.02 MINIMUM STAFFING

A. The CSI shall provide the following minimum staffing available during the FAT:

1. Control Systems Integrator – Project Manager or Lead ENGINEER/Programmer.
2. 1 - PLC/HMI Programmer.

END OF SECTION 16993

Appendix A
Geotechnical Report

Appendix D
30% Design Drawings





ECS Florida, LLC

Geotechnical Engineering Report

North Beach WTP

415 Nineteenth Street
St. Augustine, Florida

ECS Project Number 35:36314

February 7, 2025

February 7, 2025

Mr. Scott Trigg, P.E.
St. Johns County Utility Department
1205 SR-16
St. Augustine, Florida 32084

ECS Project No. 35:36314

Reference: Geotechnical Engineering Report
North Beach WTP Expansion
415 Nineteenth Street
St. Augustin, Florida

Dear Mr. Trigg:

ECS Florida, LLC. (ECS) has completed the subsurface exploration, visual classification, and geotechnical engineering analyses for the above-referenced project. Our services were performed in general accordance with our agreed to scope of work. This report presents our understanding of the geotechnical aspects of the project along with the results of the field exploration and visual classification conducted, and our design and construction recommendations.

It has been our pleasure to be of service to St. Johns County Utility Department during the design phase of this project. We would appreciate the opportunity to remain involved during the continuation of the design phase, and we would like to provide our services during construction phase operations as well to verify the assumptions of subsurface conditions made for this report. Should you have any questions concerning the information contained in this report, or if we can be of further assistance to you, please contact us.

Respectfully submitted,
ECS Florida, LLC.

Nathan D. Hildreth, E.I.
Geotechnical Project Manager
NHildreth@ecslimited.com

Jared Pitts, P.E.
Associate Principal Engineer
Registered, Florida No. 92090
JPitts@ecslimited.com

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- Subsurface Exploration Procedure: Standard Penetration Testing (SPT)
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EXECUTIVE SUMMARY

This Executive Summary is intended as a very brief overview of the primary geotechnical conditions that are expected to affect design and construction. Information gleaned from the Executive Summary should not be utilized in lieu of reading the entire geotechnical report.

- We understand that the project will consist of an expansion to the existing water treatment facility. The expansion will include the construction of a new 200,000-gallon reclaimed water ground storage tank.

- Based on the results of our exploration, we consider the subsurface conditions at the site adaptable for support of the proposed tank on a properly designed mat and conventional shallow foundation system with a maximum allowable bearing pressure of 2,500 psf. However, we expect that the 200,000-gallon tank, once filled, could experience total settlement on the order of 2 inches.

- The borings encountered groundwater at an approximate depth of 2 ½ feet to 3 ¼ feet below the existing ground surface at the time of our exploration. Because of the need for densification of the soils within the upper 2 feet below the stripped surface, temporary groundwater control measures may be required if the groundwater level is within 2 feet below the stripped and grubbed surface at the time of construction.

- We recommend that ECS be provided the opportunity to review the foundation plans and earthwork specifications to verify that our recommendations have been properly interpreted and implemented. ECS should also be retained to perform the construction materials testing and observations required for this project, to verify that our recommendations have been implemented.

1.0 INTRODUCTION

The purpose of this study was to provide geotechnical information for the design of foundations for the proposed water treatment facility expansion. The project will include the construction of a 200,000-gallon reclaimed water ground storage tank. The recommendations developed for this report are based on project information supplied by you.

Our services were provided in accordance with our Proposal No. 35:22954, dated November 13, 2024, as authorized by Leigh A. Daniels on November 18, 2024, under Contract Task Order No: 10.

This report contains the procedures and results of our subsurface exploration and visual classification programs, review of existing site conditions, engineering analyses, and recommendations for the design and construction of the project.

The report includes the following items:

- A brief review and description of our field testing and visual classification procedures and the results of testing conducted.
- A review of surface topographical features and site conditions.
- A review of subsurface soil stratigraphy with pertinent available physical properties.
- Final copies of our soil boring logs.
- Recommendations for foundation design.
- Evaluation and recommendations relative to groundwater control.
- Recommendations for site preparation and construction of compacted fills.

2.0 PROJECT INFORMATION

2.1 PROJECT LOCATION/CURRENT SITE USE

The project site is located at 415 Nineteenth Street in St. Augustine, Florida. The project site is bordered to the north by Nineteenth Street, to the east by single-family residences, to the south by Twentieth Street, and to the west by Myrtle Street. The general site location is shown on Figure 1 in Appendix A and Figure 2.1.1 following.

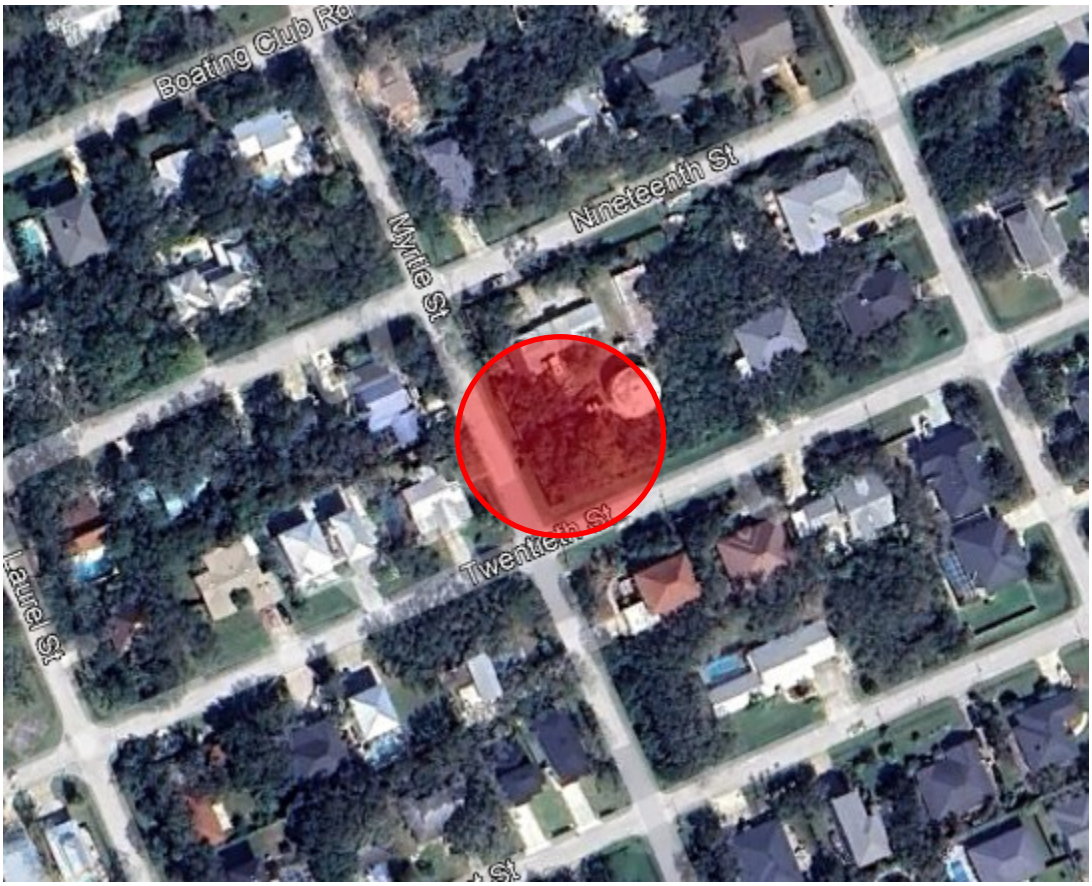


Figure 2.1.1. Site Location

At the time of our exploration, the site was undeveloped, with surface cover consisting of grass, brush, and trees. Based on the site survey provided to our office, we understand that the site generally slopes downward towards the south. Surface water was not observed near planned structural areas at the time of our exploration.

2.2 PROPOSED CONSTRUCTION

The following information explains our understanding of the planned development including proposed structures and related infrastructure.

SUBJECT	DESIGN INFORMATION / UNDERSTANDINGS
Anticipated Tank Diameter	Approximately 50 feet in plan view
Anticipated Tank Height	Approximately 14 feet
Usage	WRF Ground Storage
Storage Capacity	200,000 Gallons

SUBJECT	DESIGN INFORMATION / UNDERSTANDINGS
Anticipated Mat Foundation Bearing Pressure	850 psf

If actual project information varies from these conditions, then the recommendations in this report may need to be re-evaluated. We should be contacted if any of the above project information is incorrect so that we may reevaluate our recommendations.

3.0 FIELD EXPLORATION AND VISUAL CLASSIFICATION

Our exploration procedures are explained in greater detail in Appendix B including the insert titled Subsurface Exploration Procedures. Our scope of work included drilling five Standard Penetration Test (SPT) borings. Our borings were located with a handheld GPS unit and their approximate locations are shown on the Field Exploration Diagram (Figure 2) in Appendix A.

3.1 SUBSURFACE CHARACTERIZATION

The subsurface conditions encountered were generally consistent with published geological mapping. The following sections provide generalized characterizations of the soil strata. Please refer to the boring logs in Appendix B.

Typical Depth (ft)		Stratum	Description
From	To		
Existing Ground Surface	0.5	n/a	Topsoil
0.5	27	I	Very Loose to Very Dense Fine SAND (SP), Trace Shell, Moist to Wet
27	32	II	Medium Dense SHELL With Sand or Very Soft CLAY With Shell, Wet
32	47	IV	Dense to Very Dense Fine SAND (SP) and Fine SAND With Silt (SP-SM), Wet
47	52	V	Soft to Firm CLAY (CH), Wet
52	72	VI	Loose to Medium Dense Fine SAND (SP), Silty Fine SAND (SM), and Clayey Fine SAND (SC), Wet
72	82	VII	Firm to Soft CLAY (CH), Wet
82	87	VIII	Loose Clayey Fine SAND (SC), Wet
87	92	IX	Stiff SILT (MH), Wet
92	97	X	Very Dense Medium SAND (SP), Wet

Typical Depth (ft)		Stratum	Description
From	To		
97	100	XI	Very Stiff CLAY (CH), Wet

A graphical presentation of the subsurface conditions is shown on the Generalized Subsurface Profiles included in Appendix A.

3.2 GROUNDWATER OBSERVATIONS

3.2.1 Encountered Groundwater

Water levels were measured during our field exploration and are presented in our boring logs in Appendix B. Groundwater depths were measured at approximately 2 ½ feet to 3 ¼ feet below the ground surface at the time of drilling. Variations in the long-term water table may occur as a result of changes in precipitation, evaporation, surface water runoff, construction activities, and other factors.

3.2.2 Estimated Seasonal High Groundwater

The normal seasonal high groundwater level is affected by a number of factors. The drainage characteristics of the soils, land surface elevation, relief points such as drainage ditches, lakes, rivers, swamp areas, etc., and distance to relief points are some of the more important factors influencing the seasonal high groundwater level.

Based on our interpretation of the site conditions, including the boring logs and Web Soil Survey, we estimate the normal seasonal high groundwater level at the boring locations to be approximately at the depth shown on the Generalized Subsurface Profiles. It is possible that groundwater levels may exceed the estimated normal seasonal high groundwater level as a result of significant or prolonged rains.

3.3 VISUAL CLASSIFICATION

Each sample was visually classified on the basis of texture and plasticity in accordance with ASTM D2488 Standard Practice for Description and Identification of Soils (Visual-Manual Procedures) and including USCS classification symbols. After classification, the samples were grouped in the major zones noted on the boring logs in Appendix B. The group symbols for each soil type are indicated in parentheses along with the soil descriptions. The stratification lines between strata on the logs are approximate; in situ, the transitions may be gradual.

4.0 DESIGN RECOMMENDATIONS

4.1 GROUND STORAGE TANK RECOMMENDATIONS

The finished floor elevation of the ground storage tank was not known at the time of this report preparation. However, based on the results of our exploration we anticipate that most of the soils at the foundation bearing elevation are generally anticipated to be suitable for support of the proposed structure, after preparation in accordance with Section 5.0 of this report. The bearing level soils, after compaction, should exhibit densities equivalent to at least 95 percent of the modified Proctor maximum dry density (ASTM D 1557) to a depth of at least one foot below foundation bearing levels.

For design purposes, we recommend that the groundwater table be assumed to be at the ground surface.

4.1.1 Bearing Pressure

The maximum allowable net soil bearing pressure for use in ring shallow foundation design should not exceed 2,500 psf. Net bearing pressure is defined as the soil bearing pressure at the foundation bearing level in excess of the natural overburden pressure at that level. The foundations should be designed based on the maximum load that could be imposed by all loading conditions. A modulus of subgrade of 150 pci may be used for the concrete mat foundation design. Based on the provided tank volume and diameter, we estimate that the floor load will be approximately 850 psf.

The ring wall foundations should have a minimum width of 18 inches and bear at a depth of at least 18 inches below the exterior final grades to provide confinement to the bearing level soils. It is recommended that stormwater be diverted away from the tank exterior to reduce the possibility of erosion beneath the footings.

4.1.2 Settlement Estimates

Based on the results of the field exploration for the 200,000-gallon ground storage tank, the anticipated loading conditions, and the field data that we have correlated to the estimated geotechnical strength and compressibility characteristics of the subsurface soils, we estimate that total settlements to be as follows:

Estimated Initial Settlement* (inches)	Estimated Consolidation Settlement** (in)	Estimated Differential Settlement*** (in)
1.0	1.0	0.75

* Settlement as the tank is filled.
** Settlement from consolidation of the clay soils will take place over several months.
*** Settlement differential from center of tank to perimeter

Our settlement estimates show that approximately 50 percent of the total settlement occurs within the very soft clay (CH) strata between approximate depths of 27 feet and 32 feet below the ground surface after the tank has been filled. If the total or differential settlement of the tanks is found to be excessive for structural integrity or functionality, then we recommend ECS be contacted to provide additional recommendations.

5.0 SITE CONSTRUCTION RECOMMENDATIONS

5.1 SUBGRADE PREPARATION

5.1.1 Stripping and Grubbing

Prior to construction, the location of existing underground utilities within the construction area should be established. Provisions should then be made to relocate interfering utilities to appropriate locations. Underground pipes that are not properly removed or plugged may serve as conduits for subsurface erosion, which may subsequently lead to excessive settlement of overlying structures.

The "footprint" of the proposed structures plus a minimum additional horizontal margin of 5 feet, and of the hardscape areas (parking/driveway) plus a minimum additional horizontal margin of 3 feet, should be stripped of all surface vegetation, stumps, debris, organic topsoil, or other deleterious materials. During grubbing operations, roots with a diameter greater than 0.5-inch, stumps, or small roots in a concentrated state, should be grubbed and completely removed.

Based on the results of our field exploration, it should be anticipated that 6 inches or less of topsoil or soils containing significant amounts of organic materials may be encountered across the site. The actual depths of unsuitable soils and materials should be determined by ECS using visual observation and judgment during earthwork operations. Any topsoil removed from the structures and parking/drive areas can be stockpiled and used subsequently in non-structural areas.

5.1.2 Temporary Groundwater Control

Because of the need for densification of the soils within the upper 2 feet below the stripped surface, temporary groundwater control measures may be required if the groundwater level is within 2 feet below the stripped and grubbed surface at the time of construction. **Should groundwater control measures become necessary, dewatering methods should be determined by the contractor.** We recommend the groundwater control measures, if necessary; remain in place until compaction of the existing soils is completed. The dewatering method should be maintained until backfilling has reached a height of 2 feet above the groundwater level at the time of construction. The site should be graded to direct surface water runoff from the construction area.

5.1.3 Subgrade Compaction

Subgrade Compaction: After completing the clearing and stripping operations and installing the temporary groundwater control measures (if required), the exposed surface should be compacted with a vibratory drum roller having a minimum static, at-drum weight, on the order of 4 tons to 6 tons. Typically, the material should exhibit moisture contents within ±2 percentage points of the modified Proctor optimum moisture content (ASTM D 1557) during the compaction operations. Compaction should continue until densities of at least 95 percent of the modified Proctor maximum dry density (ASTM D 1557) have been achieved within the upper one foot of the compacted natural soils at the site.

Should the bearing level soils experience pumping and soil strength loss during the compaction operations, compaction work should be immediately terminated, and (1) the disturbed soils should be

removed and backfilled with compacted engineered fill, or (2) the excess moisture content within the disturbed soils should be allowed to dissipate before recompacting.

Care should be exercised to avoid damaging any nearby structures while the compaction operation is underway. Prior to commencing compaction, occupants of adjacent structures should be notified, and the existing conditions of the structures should be documented with photographs and survey (if deemed necessary). Compaction should cease if deemed detrimental to adjacent structures, and ECS should be contacted immediately. We recommend the vibratory roller remain a minimum of 50 feet from existing structures. Within this zone, use of a track-mounted bulldozer, or a vibratory roller operating in the static mode, is recommended.

5.2 EARTHWORK OPERATIONS

5.2.1 Engineered Backfill and Fill Soils

Engineered fill is defined as a non-plastic, inorganic, granular soil having less than 15 percent material passing the No. 200 mesh sieve and containing less than 4 percent organic material. In landscape and lot areas, we recommend the upper 1 foot of material be engineered fill with less than 10 percent material passing the No. 200 mesh sieve to facilitate drainage. The fine sand and fine sand with silt or fine sand with clay, without roots, as encountered in the borings, are generally suitable as fill materials and, with proper moisture control, should densify using conventional compaction methods. Soils with more than 10 to 12 percent passing the No. 200 sieve will be more difficult to compact, due to their nature to retain soil moisture, and may require drying.

Engineered Fill Compaction Requirements: Materials satisfactory for use as engineered fill should consist of soils with the following compaction requirements.

ENGINEERED FILL COMPACTION REQUIREMENTS	
Subject	**Requirement**
Compaction Standard	Modified Proctor, ASTM D1557
Required Compaction	95% of Max. Dry Density (general engineered fill) 98% of Max. Dry Density (upper one foot below the proposed pavement base course)
Loose Thickness prior to compaction	12 inches if vibratory drum roller compaction equipment is used 8 inches if vibratory drum roller is used in static mode 8 inches if track-mounted compaction equipment is used 6 inches if hand-held compaction equipment is used

Fill materials should not be placed on excessively wet soils. Excessively wet soils should be moisture conditioned, which may include scarifying and aerating. Proper drainage should be maintained during the earthwork phases of construction in an attempt to prevent ponding of water which has a tendency to degrade subgrade soils. The contractor should minimize dusting or implement dust control measures, as required.

We recommend that the grading contractor have equipment on site during earthwork for both drying and wetting fill soils. Moisture control may be difficult during extended periods of rain. The control of moisture content of soils containing more than 10% fines may be difficult when these soils become wet. Further, such soils are easily degraded by construction traffic when the moisture content is elevated.

5.2.2 Foundation Areas

After satisfactory placement and compaction of the required engineered fill, the foundation areas may be excavated to the planned bearing levels. The foundation bearing level soils, after compaction, should exhibit densities equivalent to at least 95 percent of the modified Proctor maximum dry density (ASTM D 1557) to a depth of one foot below the bearing level. For confined areas, such as the footing excavations, any compactive effort should be provided by a lightweight vibratory sled or roller having a total weight on the order of 500 to 2,000 pounds.

5.3 GENERAL CONSTRUCTION CONSIDERATIONS

Moisture Conditioning: We anticipate that typical moisture conditioning for soils in this area should be anticipated. The sandy surface soils may require wetting during dry periods or periods of high heat. Drying of soils containing more than 10% fines or excavated from below the water table may be required to be within ±2 percentage points of the modified Proctor optimum moisture content (ASTM D 1557).

Subgrade Protection: Measures should also be taken to limit site disturbance, especially from rubber-tired heavy construction equipment, and to control and remove surface water from development areas, including structural and pavement areas. It would be advisable to designate a haul road and construction staging area to limit the areas of disturbance and to prevent construction traffic from excessively degrading sensitive subgrade soils and existing pavement areas. Haul roads and construction staging areas could be covered with excess depths of aggregate to protect those subgrades. The aggregate can later be removed and can likely be used in pavement areas.

Surface Drainage: Surface drainage conditions should be properly maintained. Surface water should be directed away from the construction area, and the work area should be sloped away from the construction area at a gradient of at least 1 percent or greater to reduce the potential of ponding water and the subsequent saturation of the surface soils. At the end of each work day, the subgrade soils should be sealed by rolling the surface with a smooth drum roller to limit infiltration of surface water.

Excavation Safety: All excavations and slopes should be made and maintained in accordance with OSHA excavation safety standards. The contractor is solely responsible for designing and constructing stable, temporary excavations and slopes and should shore, slope, or bench the sides of the excavations and slopes as required to maintain stability of both the excavation sides and bottom. The contractor's responsible person, as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations. ECS is providing this information solely as a service to our client. ECS is not assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred.

Erosion Control: The surface soils may be erodible. Therefore, the Contractor should provide and maintain good site drainage during earthwork operations to maintain the integrity of the surface soils. All erosion and sedimentation controls should be in accordance with sound engineering practices and local requirements.

6.0 CLOSING

Our geotechnical exploration has been performed, our findings presented, and our recommendations prepared, in accordance with generally accepted geotechnical engineering principles and practices. ECS is not responsible for any independent conclusions, interpretation, opinions, or recommendations made by others based on the data contained in this report.

Our scope of services was intended to evaluate the soil conditions within the zone of soil influenced by the foundation system. Our scope of services does not address geologic conditions, such as sinkholes or soil conditions existing below the depth of the soil borings.

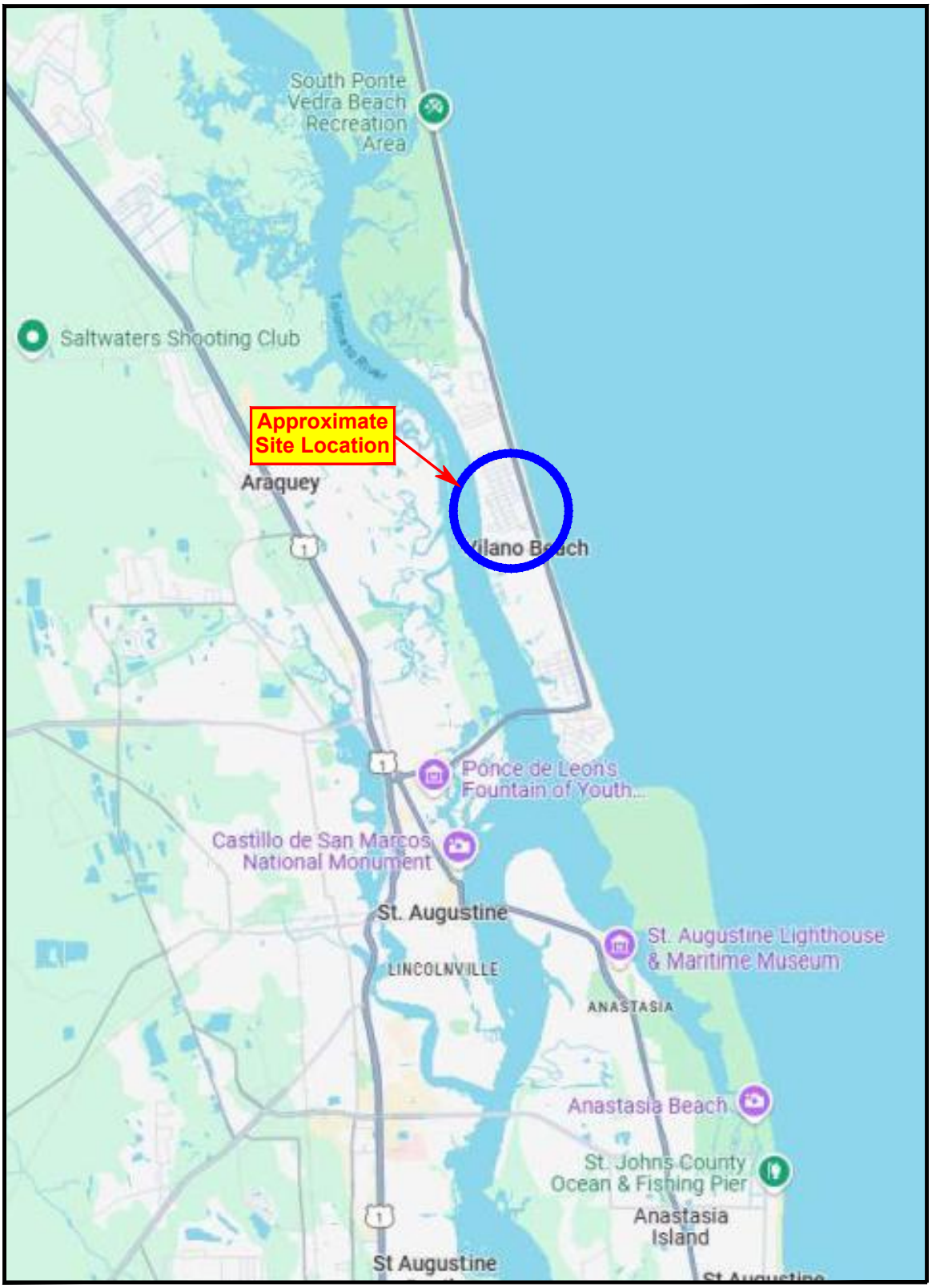
If any of the project description information discussed in this report is inaccurate, either due to our interpretation of the documents provided or site or design changes that may occur later, ECS should be contacted immediately in order that we can review the report in light of the changes and provide additional or alternate recommendations as may be required to reflect the proposed construction.
We recommend that ECS be retained to review the project's plans and specifications pertaining to our work so that we may ascertain consistency of those plans/specifications with the intent of the geotechnical report.

Field observations, monitoring, and quality assurance testing during earthwork and foundation installation are an extension of and integral to the geotechnical design recommendation. We recommend that the owner retain these quality assurance services and that ECS be retained to continue our involvement throughout these critical phases of construction to provide general consultation as issues arise.

ECS is not responsible for the conclusions, opinions, or recommendations of others based on the data in this report.

Appendix A - Drawings and Reports

Site Location Diagram
Exploration Location Diagram(s)
Subsurface Cross-Section(s)



ECS Florida, LLC
Geotechnical ■ Construction Materials ■ Environmental ■ Facilities
11554 Davis Creek Court, Jacksonville, FL 32256
T: (904) 880-0960 ● F: (904) 880-0970
www.ecslimited.com

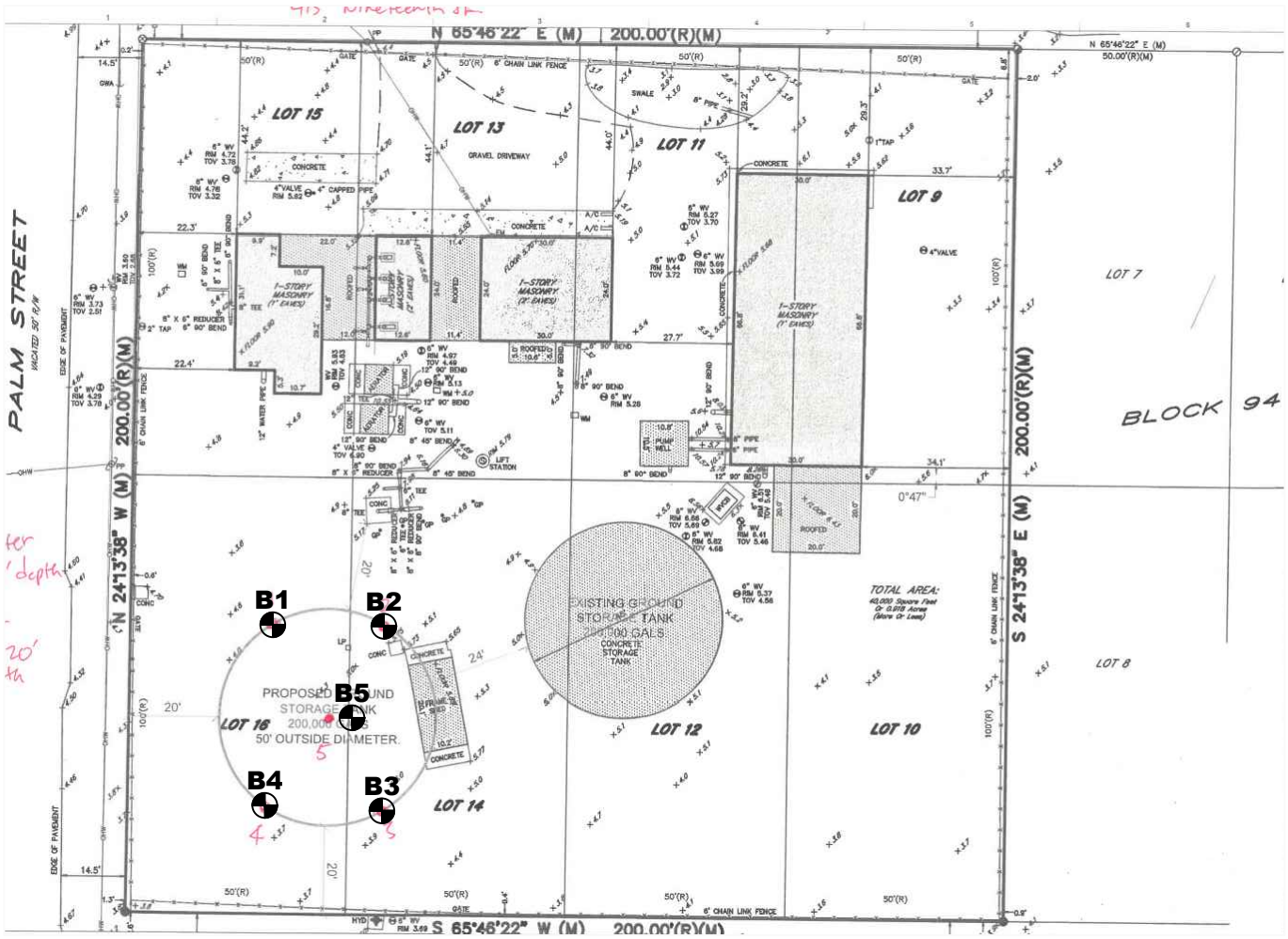
Site Location Diagram

North Beach WTP Expansion

St. Augustine, Florida

Date: 01/21/25	Project No.: 35-36314	Figure 1

JAS - 35-36314



LEGEND

Approximate Location of Standard Penetration Test (SPT) Boring

ECS Florida, LLC

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11554 Davis Creek Court, Jacksonville, FL 32256
T: (904) 880-0960 ● F: (904) 880-0970
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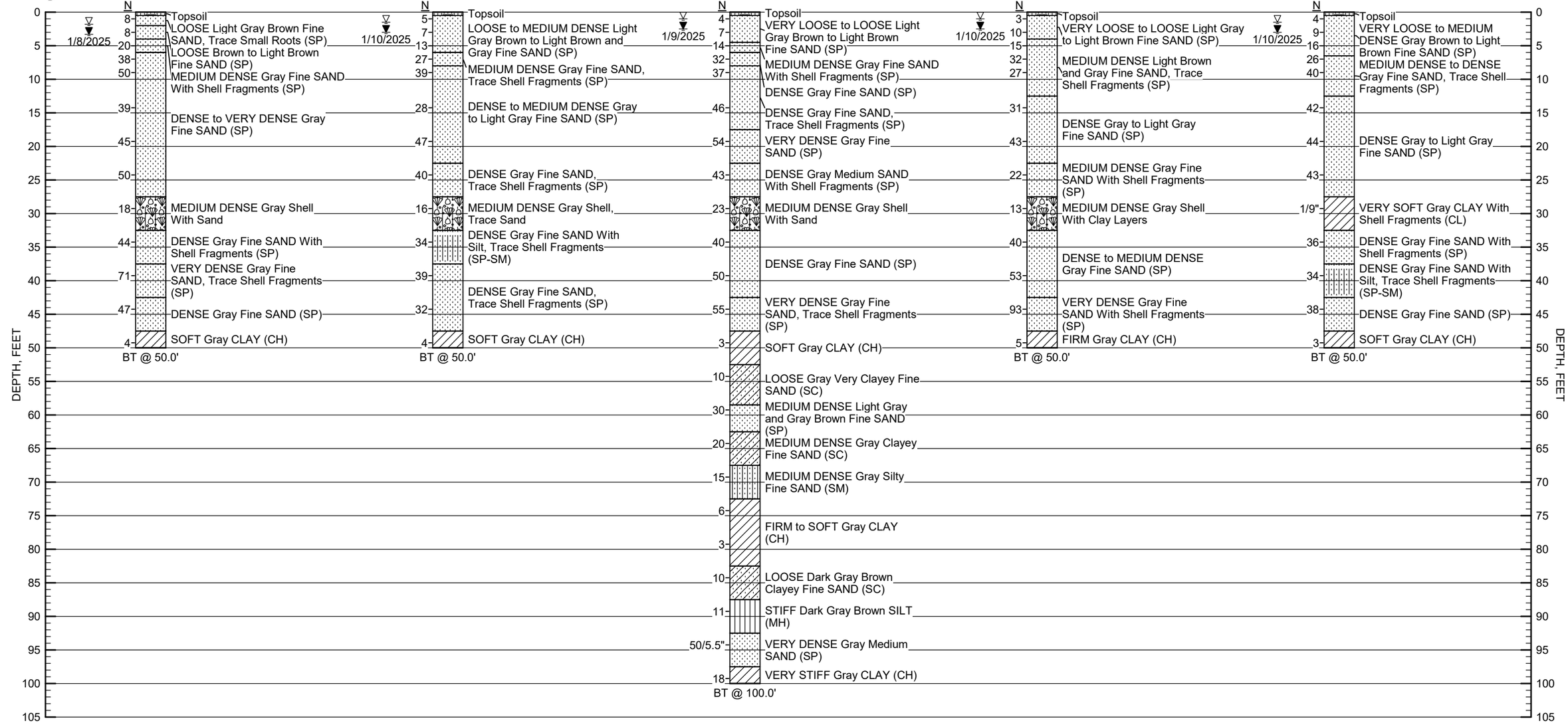
Field Exploration Diagram

North Beach WTP Expansion

St. Augustine, Florida

Date: 01/21/25	Project No.: 35-36314	Figure 2

JAS - 35-36314



LEGEND

- Topsoil
- Fine SAND (SP)
- Fine SAND With Silt (SP-SM)
- Silty Fine SAND (SM)
- Clayey Fine SAND (SC)
- CLAY (CH)
- Shell
- SILT (MH)

N — Standard Penetration Resistance, Blows/Foot

SP — Unified Soil Classification System

Groundwater Level at Time of Drilling

Estimated Normal Seasonal High Groundwater Level

50/5" — Number of Blows to Drive Split Spoon Sample in Inches

BT — Boring Terminated at Depth Below Grade

Generalized Subsurface Profiles

North Beach WTP Expansion

St. Augustine, Florida

DATE: 1/21/25 | PROJ. NO.: 35-36314 | Figure 3

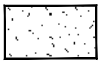
Appendix B – Field Operations

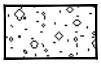
Reference Notes
Exploration Procedures
Boring Logs

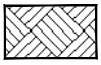
REFERENCE NOTES FOR BORING LOGS

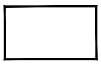
MATERIAL[1,2]

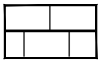

ASPHALT


CONCRETE


GRAVEL

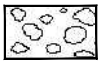

TOPSOIL

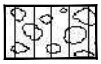

VOID


BRICK

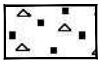

AGGREGATE BASE COURSE

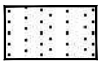

GW **WELL-GRADED GRAVEL**
gravel-sand mixtures, little or no fines

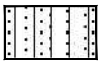

GP **POORLY-GRADED GRAVEL**
gravel-sand mixtures, little or no fines


GM **SILTY GRAVEL**
gravel-sand-silt mixtures

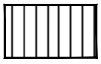

GC **CLAYEY GRAVEL**
gravel-sand-clay mixtures

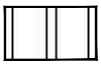

SW **WELL-GRADED SAND**
gravelly sand, little or no fines

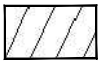

SP **POORLY-GRADED SAND**
gravelly sand, little or no fines


SM **SILTY SAND**
sand-silt mixtures

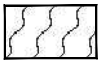

SC **CLAYEY SAND**
sand-clay mixtures

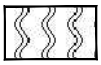

ML **SILT**
non-plastic to medium plasticity

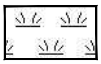

MH **ELASTIC SILT**
high plasticity


CL **LEAN CLAY**
low to medium plasticity


CH **FAT CLAY**
high plasticity


OL **ORGANIC SILT or CLAY**
non-plastic to low plasticity


OH **ORGANIC SILT or CLAY**
high plasticity


PT **PEAT**
highly organic soils

DRILLING SAMPLING SYMBOLS & ABBREVIATIONS

SS	Split Spoon Sampler	PM	Pressuremeter Test
ST	Shelby Tube Sampler	RD	Rock Bit Drilling
WS	Wash Sample	RC	Rock Core, NX, BX, AX
BS	Bulk Sample of Cuttings	REC	Rock Sample Recovery %
PA	Power Auger (no sample)	RQD	Rock Quality Designation %
HSA	Hollow Stem Auger		

PARTICLE SIZE IDENTIFICATION

DESIGNATION		PARTICLE SIZES
Boulders		12 inches (300 mm) or larger
Cobbles		3 inches to 12 inches (75 mm to 300 mm)
Gravel:	Coarse	¾ inch to 3 inches (19 mm to 75 mm)
	Fine	4.75 mm to 19 mm (No. 4 sieve to ¾ inch)
Sand:	Coarse	2.00 mm to 4.75 mm (No. 10 to No. 4 sieve)
	Medium	0.425 mm to 2.00 mm (No. 40 to No. 10 sieve)
	Fine	0.074 mm to 0.425 mm (No. 200 to No. 40 sieve)
Silt & Clay ("Fines")		<0.074 mm (smaller than a No. 200 sieve)

COHESIVE SILTS & CLAYS

UNCONFINED COMPRESSIVE STRENGTH, Q_P[4]	SPT[5] (BPF)	CONSISTENCY[7] (COHESIVE)
<0.25	<2	Very Soft
0.25 - <0.50	2 - 4	Soft
0.50 - <1.00	5 - 8	Firm
1.00 - <2.00	9 - 15	Stiff
2.00 - <4.00	16 - 30	Very Stiff
4.00 - 8.00	31 - 50	Hard
>8.00	>50	Very Hard

GRAVELS, SANDS & NON-COHESIVE SILTS

SPT[5]	DENSITY
<5	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
>50	Very Dense

RELATIVE AMOUNT[7]	COARSE GRAINED (%)[8]	FINE GRAINED (%)[8]
Trace	≤5	≤5
With	10 - 20	10 - 25
Adjective *(ex: "Silty")*	25 - 45	30 - 45

WATER LEVELS[6]

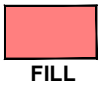

WL (First Encountered)


WL (Completion)


WL (Seasonal High Water)


WL (Stabilized)

FILL AND ROCK


FILL


POSSIBLE FILL


PROBABLE FILL


ROCK

[1]Classifications and symbols per ASTM D 2488-17 (Visual-Manual Procedure) unless noted otherwise.

[2]To be consistent with general practice, "POORLY GRADED" has been removed from GP, GP-GM, GP-GC, SP, SP-SM, SP-SC soil types on the boring logs.

[3]Non-ASTM designations are included in soil descriptions and symbols along with ASTM symbol [Ex: (SM-FILL)].

[4]Typically estimated via pocket penetrometer or Torvane shear test and expressed in tons per square foot (tsf).

[5]Standard Penetration Test (SPT) refers to the number of hammer blows (blow count) of a 140 lb. hammer falling 30 inches on a 2 inch OD split spoon sampler required to drive the sampler 12 inches (ASTM D 1586). "N-value" is another term for "blow count" and is expressed in blows per foot (bpf). SPT correlations per 7.4.2 Method B and need to be corrected if using an auto hammer.

[6]The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in granular soils. In clay and cohesive silts, the determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally employed.

[7]Minor deviation from ASTM D 2488-17 Note 14.

[8]Percentages are estimated to the nearest 5% per ASTM D 2488-17.

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SUBSURFACE EXPLORATION PROCEDURE: STANDARD PENETRATION TESTING (SPT) ASTM D 1586 Split-Barrel Sampling

Standard Penetration Testing, or **SPT**, is the most frequently used subsurface exploration test performed worldwide. This test provides samples for identification purposes, as well as a measure of penetration resistance, or N-value. The N-Value, or blow counts, when corrected and correlated, can approximate engineering properties of soils used for geotechnical design and engineering purposes.

SPT Procedure:

- Involves driving a hollow tube (split-spoon) into the ground by dropping a 140-lb hammer a height of 30-inches at desired depth
- Recording the number of hammer blows required to drive split-spoon a distance of 18-24 inches (in 3 or 4 Increments of 6 inches each)



- Auger is advanced* and an additional SPT is performed
- One SPT typically performed for every two to five feet. An approximate 1.5 inch diameter soil sample is recovered.



**Drilling Methods May Vary*— The predominant drilling methods used for SPT are open hole fluid rotary drilling and hollow-stem auger drilling.

Project No.: 35-36314
Boring No.: B1
Sheet 1 of 2

LOG OF BORING

Project: North Beach WTP Expansion
Client: St. Johns County BOCC
Boring Location: See Field Exploration Plan
Drill Rig: 101A
Driller: M. Foster
Drill Rod: AWJ
Drill Mud: Auto
Casing Size:
Length of Casing:
Groundwater Depth: 3.3 ft Time: Drilling Date: 1/8/25
Boring Begun: 1/8/25
Boring Completed: 1/8/25

SAMPLE NO.	DEPTH, FEET	SAMPLE TYPE	DESCRIPTION	BLOWS PER 6 IN.	N Value	PERCENT ORGANIC MATERIAL	PERCENT PASSING NO. 200 SIEVE
	0		Topsoil	2			
1			LOOSE Light Gray Brown Fine SAND, Trace Small Roots (SP)	4 4 5	8		
			LOOSE Brown to Light Brown Fine SAND (SP)	5 4			
2				4 5	8		
			MEDIUM DENSE Gray Fine SAND With Shell Fragments (SP)	8 8			
3	5			12 12	20		
			DENSE to VERY DENSE Gray Fine SAND (SP)	10 18			
4				20 26	38		
				16 22			
5				28 34	50		
	10						
				13			
6				18 21	39		
	15						
				18			
7				21 24	45		
	20						
				11			
8				20 30	50		
	25						

PLASTIC LIMIT ○ | MOISTURE CONTENT + | LIQUID LIMIT ◇
(%) 0 10 20 30 40

SHEAR STRENGTH (ksf)
0 1 2
⊙ Pocket Penetrometer Undisturbed Sample
◒ Pocket Penetrometer Disturbed Sample
▼ Torvane
● Unconfined Compression
⊠ Triaxial Compression

Remarks

Project No.: 35-36314
Boring No.: B1
Sheet 2 of 2

LOG OF BORING

Project: North Beach WTP Expansion
Client: St. Johns County BOCC
Boring Location: See Field Exploration Plan
Drill Rig: 101A
Driller: M. Foster
Drill Rod: AWJ
Drill Mud: Auto
Casing Size:
Length of Casing:
Groundwater Depth: 3.3 ft Time: Drilling Date: 1/8/25
Boring Begun: 1/8/25
Boring Completed: 1/8/25

SAMPLE NO.	DEPTH, FEET	SAMPLE TYPE	DESCRIPTION	BLOWS PER 6 IN.	N Value	PERCENT ORGANIC MATERIAL	PERCENT PASSING NO. 200 SIEVE
	25		DENSE to VERY DENSE Gray Fine SAND (SP) *(Continued)*				
			MEDIUM DENSE Gray Shell With Sand				
9				6 9 9	18		
	30						
			DENSE Gray Fine SAND With Shell Fragments (SP)				
10				20 21 23	44		
	35						
			VERY DENSE Gray Fine SAND, Trace Shell Fragments (SP)				
11				20 32 39	71		
	40						
			DENSE Gray Fine SAND (SP)				
12				17 22 25	47		
	45						
			SOFT Gray CLAY (CH)				
13				1 2 2	4		
	50		Boring Terminated @ 50 ft.				

PLASTIC LIMIT ○ | MOISTURE CONTENT + (%) | LIQUID LIMIT ◇
0 10 20 30 40

SHEAR STRENGTH (ksf)
⊙ Pocket Penetrometer Undisturbed Sample
◕ Pocket Penetrometer Disturbed Sample
▼ Torvane
● Unconfined Compression
⊠ Triaxial Compression
0 1 2

Remarks

Project No.: 35-36314
Boring No.: B2
Sheet 1 of 2

LOG OF BORING

Project: North Beach WTP Expansion
Client: St. Johns County BOCC
Boring Location: See Field Exploration Plan
Drill Rig: 101A
Driller: M. Foster
Drill Rod: AWJ
Drill Mud: Auto
Casing Size:
Length of Casing:
Groundwater Depth: 3 ft Time: Drilling Date: 1/10/25
Boring Begun: 1/10/25
Boring Completed: 1/10/25

SAMPLE NO.	DEPTH, FEET	SAMPLE TYPE	DESCRIPTION	BLOWS PER 6 IN.	N Value	PERCENT ORGANIC MATERIAL	PERCENT PASSING NO. 200 SIEVE
	0		Topsoil	2			
1			LOOSE Light Gray Brown Fine SAND (SP)	2 3 3 3	5		
2			LOOSE to MEDIUM DENSE Light Brown Fine SAND (SP) ▼	3 4 5 5	7		
3	5		MEDIUM DENSE Gray Fine SAND (SP)	6 7 10	13		
4			MEDIUM DENSE Gray Fine SAND, Trace Shell Fragments (SP)	8 11 16 17	27		
5			DENSE to MEDIUM DENSE Gray Fine SAND (SP)	12 18 21 24	39		
	10						
6				11 13 15	28		
	15						
			DENSE Light Gray Fine SAND (SP)				
7				17 22 25	47		
	20						
			DENSE Gray Fine SAND, Trace Shell Fragments (SP)				
8				10 17 23	40		
	25						

PLASTIC LIMIT ○ | MOISTURE CONTENT + (%) | LIQUID LIMIT ◇
0 10 20 30 40

SHEAR STRENGTH (ksf)
0 1 2
⊙ Pocket Penetrometer Undisturbed Sample
◕ Pocket Penetrometer Disturbed Sample
▼ Torvane
● Unconfined Compression
⊠ Triaxial Compression

Remarks

Project No.: 35-36314
Boring No.: B2
Sheet 2 of 2

LOG OF BORING

Project: North Beach WTP Expansion
Client: St. Johns County BOCC
Boring Location: See Field Exploration Plan
Drill Rig: 101A
Driller: M. Foster
Drill Rod: AWJ
Drill Mud: Auto
Casing Size:
Length of Casing:
Groundwater Depth: 3 ft Time: Drilling Date: 1/10/25
Boring Begun: 1/10/25
Boring Completed: 1/10/25

SAMPLE NO.	DEPTH, FEET	SAMPLE TYPE	DESCRIPTION	BLOWS PER 6 IN.	N Value	PERCENT ORGANIC MATERIAL	PERCENT PASSING NO. 200 SIEVE
	25		DENSE Gray Fine SAND, Trace Shell Fragments (SP) *(Continued)*				
			MEDIUM DENSE Gray Shell, Trace Sand				
9	30			5 6 10	16		
			DENSE Gray Fine SAND With Silt, Trace Shell Fragments (SP-SM)				
10	35			12 16 18	34		
			DENSE Gray Fine SAND, Trace Shell Fragments (SP)				
11	40			15 18 21	39		
12	45			13 15 17	32		
			SOFT Gray CLAY (CH)				
13	50			1 2 2	4		

Boring Terminated @ 50 ft.

PLASTIC LIMIT ○ | MOISTURE CONTENT + | LIQUID LIMIT ◇ (%) 0 10 20 30 40

SHEAR STRENGTH (ksf)
- Pocket Penetrometer Undisturbed Sample
- Pocket Penetrometer Disturbed Sample
- Torvane
- Unconfined Compression
- Triaxial Compression

0 1 2

Remarks

Project No.: 35-36314
Boring No.: B3
Sheet 1 of 4

LOG OF BORING

Project: North Beach WTP Expansion
Client: St. Johns County BOCC
Boring Location: See Field Exploration Plan
Drill Rig: 101A
Driller: M. Foster
Drill Rod: AWJ
Drill Mud: Auto
Casing Size:
Length of Casing:
Groundwater Depth: 2.5 ft Time: Drilling Date: 1/9/25
Boring Begun: 1/9/25
Boring Completed: 1/9/25

SAMPLE NO.	DEPTH, FEET	SAMPLE TYPE	DESCRIPTION	BLOWS PER 6 IN.	N Value	PERCENT ORGANIC MATERIAL	PERCENT PASSING NO. 200 SIEVE
	0		Topsoil	1			
1			VERY LOOSE Light Gray Brown Fine SAND (SP)	2 2 2	4		
2			LOOSE Light Brown Fine SAND (SP)	3 4 5	7		
3	5		MEDIUM DENSE Gray Fine SAND With Shell Fragments (SP)	5 6 8	14		
4			DENSE Gray Fine SAND (SP)	10 7 12 20	32		
5			DENSE Gray Fine SAND, Trace Shell Fragments (SP)	24 13 17 20	37		
	10			23			
6				15 20 26	46		
	15		VERY DENSE Gray Fine SAND (SP)				
7				18 24 30	54		
	20		DENSE Gray Medium SAND With Shell Fragments (SP)				
8				16 20 23	43		
	25						

PLASTIC LIMIT ○ | MOISTURE CONTENT + (%) 0 10 20 30 40 | LIQUID LIMIT ◇

SHEAR STRENGTH (ksf)
- Pocket Penetrometer Undisturbed Sample
- Pocket Penetrometer Disturbed Sample
- Torvane
- Unconfined Compression
- Triaxial Compression

0 1 2

Remarks

Project No.: 35-36314
Boring No.: B3
Sheet 2 of 4

LOG OF BORING

Project: North Beach WTP Expansion
Client: St. Johns County BOCC
Boring Location: See Field Exploration Plan
Drill Rig: 101A
Driller: M. Foster
Drill Rod: AWJ
Drill Mud: Auto
Casing Size:
Length of Casing:
Groundwater Depth: 2.5 ft Time: Drilling Date: 1/9/25
Boring Begun: 1/9/25
Boring Completed: 1/9/25

SAMPLE NO.	DEPTH, FEET	SAMPLE TYPE	DESCRIPTION	BLOWS PER 6 IN.	N Value	PERCENT ORGANIC MATERIAL	PERCENT PASSING NO. 200 SIEVE
	25		DENSE Gray Medium SAND With Shell Fragments (SP) *(Continued)*				
			MEDIUM DENSE Gray Shell With Sand				
9				9 11 12	23		
	30						
			DENSE Gray Fine SAND (SP)				
10				10 18 22	40		
	35						
11				18 24 26	50		
	40						
			VERY DENSE Gray Fine SAND, Trace Shell Fragments (SP)				
12				22 25 30	55		
	45						
			SOFT Gray CLAY (CH)				
13				1 1 2	3		
	50						

PLASTIC LIMIT ○ | MOISTURE CONTENT + (%) | LIQUID LIMIT ◇
0 10 20 30 40

SHEAR STRENGTH (ksf)
0 1 2
⊙ Pocket Penetrometer Undisturbed Sample
◕ Pocket Penetrometer Disturbed Sample
▼ Torvane
● Unconfined Compression
⊠ Triaxial Compression

Remarks

Project No.: 35-36314
Boring No.: B3
Sheet 3 of 4

LOG OF BORING

Project: North Beach WTP Expansion
Client: St. Johns County BOCC
Boring Location: See Field Exploration Plan
Drill Rig: 101A
Driller: M. Foster
Drill Rod: AWJ
Drill Mud: Auto
Casing Size:
Length of Casing:
Groundwater Depth: 2.5 ft Time: Drilling Date: 1/9/25
Boring Begun: 1/9/25
Boring Completed: 1/9/25

SAMPLE NO.	DEPTH, FEET	SAMPLE TYPE	DESCRIPTION	BLOWS PER 6 IN.	N Value	PERCENT ORGANIC MATERIAL	PERCENT PASSING NO. 200 SIEVE	PLASTIC LIMIT ○ / MOISTURE CONTENT + / LIQUID LIMIT ◇ (%)	SHEAR STRENGTH (ksf)
	50		SOFT Gray CLAY (CH) *(Continued)*						
			LOOSE Gray Very Clayey Fine SAND (SC)						
14				4 5 5	10				
	55								
			MEDIUM DENSE Light Gray and Gray Brown Fine SAND (SP)	5 12 18	30				
15	60								
			MEDIUM DENSE Gray Clayey Fine SAND (SC)						
16				12 10 10	20				
	65								
			MEDIUM DENSE Gray Silty Fine SAND (SM)						
17				7 7 8	15				
	70								
			FIRM to SOFT Gray CLAY (CH)						
18				2 3 3	6				
	75								

SHEAR STRENGTH (ksf)
Pocket Penetrometer Undisturbed Sample
Pocket Penetrometer Disturbed Sample
Torvane
Unconfined Compression
Triaxial Compression

0 10 20 30 40 (%)
0 1 2

Remarks

Project No.: 35-36314
Boring No.: B3
Sheet 4 of 4

LOG OF BORING

Project: North Beach WTP Expansion
Client: St. Johns County BOCC
Drill Rig: 101A
Driller: M. Foster
Boring Location: See Field Exploration Plan
Drill Rod: AWJ
Drill Mud: Auto
Casing Size:
Length of Casing:
Groundwater Depth: 2.5 ft Time: Drilling Date: 1/9/25
Boring Begun: 1/9/25
Boring Completed: 1/9/25

SAMPLE NO.	DEPTH, FEET	SAMPLE TYPE	DESCRIPTION	BLOWS PER 6 IN.	N Value	PERCENT ORGANIC MATERIAL	PERCENT PASSING NO. 200 SIEVE	PLASTIC LIMIT ○ / MOISTURE CONTENT + / LIQUID LIMIT ◇ (%)	SHEAR STRENGTH (ksf)
	75		FIRM to SOFT Gray CLAY (CH) *(Continued)*						
19	80			1 1 2	3				
			LOOSE Dark Gray Brown Clayey Fine SAND (SC)						
20	85			3 5 5	10				
			STIFF Dark Gray Brown SILT (MH)						
21	90			3 5 6	11				
			VERY DENSE Gray Medium SAND (SP)						
22	95			27 50/5.5"	50/5.5"				
			VERY STIFF Gray CLAY (CH)						
23	100			7 8 10	18				

Boring Terminated @ 100 ft.

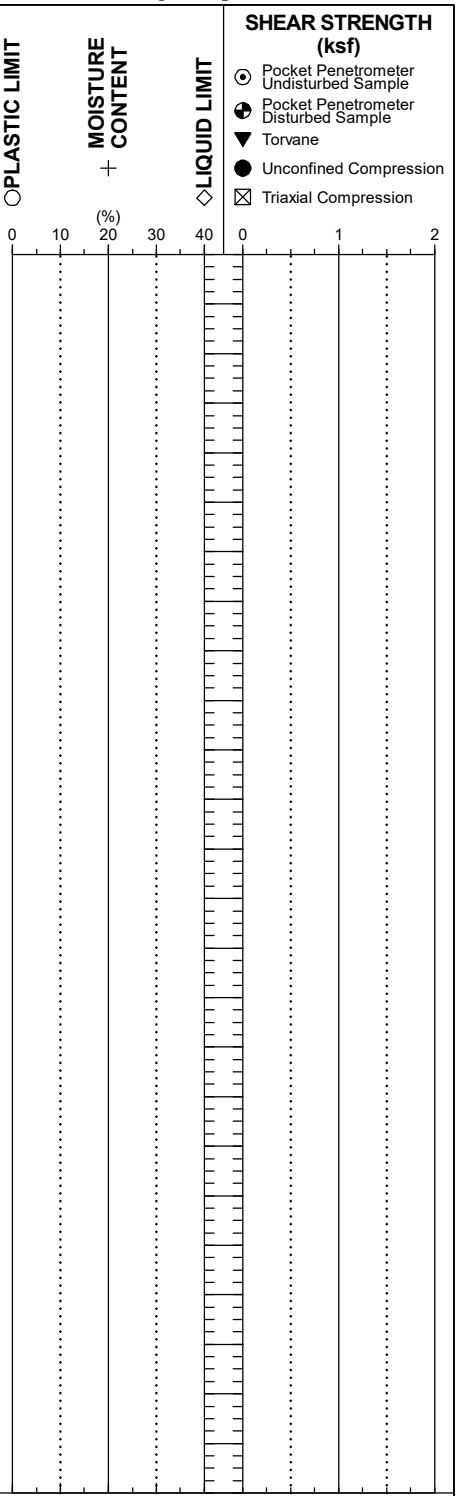
Remarks

Project No.: 35-36314
Boring No.: B4
Sheet 1 of 2

LOG OF BORING

Project: North Beach WTP Expansion
Client: St. Johns County BOCC
Boring Location: See Field Exploration Plan
Drill Rig: 101A
Driller: M. Foster
Drill Rod: AWJ
Drill Mud: Auto
Casing Size:
Length of Casing:
Groundwater Depth: 2.5 ft Time: Drilling Date: 1/10/25
Boring Begun: 1/10/25
Boring Completed: 1/10/25

SAMPLE NO.	DEPTH, FEET	SAMPLE TYPE	DESCRIPTION	BLOWS PER 6 IN.	N Value	PERCENT ORGANIC MATERIAL	PERCENT PASSING NO. 200 SIEVE
	0		Topsoil	1			
1			VERY LOOSE Light Gray Fine SAND (SP)	1 2	3		
				2 2			
2			LOOSE Light Brown Fine SAND (SP)	4 6	10		
				6			
3	5		MEDIUM DENSE Light Brown and Gray Fine SAND, Trace Shell Fragments (SP)	6 6			
				9 12	15		
4			DENSE to MEDIUM DENSE Gray Fine SAND, Trace Shell Fragments (SP)	10 15			
				17 20	32		
5				10 10			
	10			17 18	27		
			DENSE Gray Fine SAND (SP)				
6				12 14			
	15			17	31		
			DENSE Light Gray Fine SAND (SP)				
7				12 20			
	20			23	43		
			MEDIUM DENSE Gray Fine SAND With Shell Fragments (SP)				
8				11 11			
	25			11	22		



Remarks

Project No.: 35-36314
Boring No.: B4
Sheet 2 of 2

LOG OF BORING

Project: North Beach WTP Expansion
Client: St. Johns County BOCC
Boring Location: See Field Exploration Plan
Drill Rig: 101A
Driller: M. Foster
Drill Rod: AWJ
Drill Mud: Auto
Casing Size:
Length of Casing:
Groundwater Depth: 2.5 ft Time: Drilling Date: 1/10/25
Boring Begun: 1/10/25
Boring Completed: 1/10/25

SAMPLE NO.	DEPTH, FEET	SAMPLE TYPE	DESCRIPTION	BLOWS PER 6 IN.	N Value	PERCENT ORGANIC MATERIAL	PERCENT PASSING NO. 200 SIEVE
	25		MEDIUM DENSE Gray Fine SAND With Shell Fragments (SP) *(Continued)*				
			MEDIUM DENSE Gray Shell With Clay Layers				
9	30			3 5 8	13		
			DENSE to MEDIUM DENSE Gray Fine SAND (SP)				
10	35			17 20 20	40		
11	40			20 25 28	53		
			VERY DENSE Gray Fine SAND With Shell Fragments (SP)				
12	45			30 43 50	93		
			FIRM Gray CLAY (CH)				
13	50			1 2 3	5		

Boring Terminated @ 50 ft.

PLASTIC LIMIT ○ | MOISTURE CONTENT + (%) | LIQUID LIMIT ◇
0 10 20 30 40

SHEAR STRENGTH (ksf)
- Pocket Penetrometer Undisturbed Sample
- Pocket Penetrometer Disturbed Sample
- Torvane
- Unconfined Compression
- Triaxial Compression

0 1 2

Remarks

Project No.: 35-36314
Boring No.: B5
Sheet 1 of 2

LOG OF BORING

Project: North Beach WTP Expansion
Client: St. Johns County BOCC
Boring Location: See Field Exploration Plan
Drill Rig: 101A
Driller: M. Foster
Drill Rod: AWJ
Drill Mud: Auto
Casing Size:
Length of Casing:
Groundwater Depth: 3 ft Time: Drilling Date: 1/10/25
Boring Begun: 1/10/25
Boring Completed: 1/10/25

SAMPLE NO.	DEPTH, FEET	SAMPLE TYPE	DESCRIPTION	BLOWS PER 6 IN.	N Value	PERCENT ORGANIC MATERIAL	PERCENT PASSING NO. 200 SIEVE	PLASTIC LIMIT ○ / MOISTURE CONTENT + / LIQUID LIMIT ◇ (%)	SHEAR STRENGTH (ksf)
	0		Topsoil	2					
1			VERY LOOSE Gray Brown Fine SAND (SP)	2 2 2 2	4				
2			LOOSE to MEDIUM DENSE Light Brown Fine SAND (SP) ▼	4 5 5 5	9				
3	5			7 9 12	16				
4			MEDIUM DENSE to DENSE Gray Fine SAND, Trace Shell Fragments (SP)	10 11 15	26				
5				15 17 20					
	10			20 22	40				
			DENSE Gray Fine SAND (SP)						
6				15 18					
	15			24	42				
			DENSE Light Gray Fine SAND (SP)						
7				15 20					
	20			24	44				
8				17 20					
	25			23	43				

SHEAR STRENGTH (ksf)
- ⊙ Pocket Penetrometer Undisturbed Sample
- ◕ Pocket Penetrometer Disturbed Sample
- ▼ Torvane
- ● Unconfined Compression
- ⊠ Triaxial Compression

0 1 2

Remarks

Project No.: 35-36314
Boring No.: B5
Sheet 2 of 2

LOG OF BORING

Project: North Beach WTP Expansion
Client: St. Johns County BOCC
Boring Location: See Field Exploration Plan
Drill Rig: 101A
Driller: M. Foster
Drill Rod: AWJ
Drill Mud: Auto
Casing Size:
Length of Casing:
Groundwater Depth: 3 ft Time: Drilling Date: 1/10/25
Boring Begun: 1/10/25
Boring Completed: 1/10/25

SAMPLE NO.	DEPTH, FEET	SAMPLE TYPE	DESCRIPTION	BLOWS PER 6 IN.	N Value	PERCENT ORGANIC MATERIAL	PERCENT PASSING NO. 200 SIEVE
	25		DENSE Light Gray Fine SAND (SP) *(Continued)*				
			VERY SOFT Gray CLAY With Shell Fragments (CL)	1/9"			
9				1/9"	1/9"		
	30						
			DENSE Gray Fine SAND With Shell Fragments (SP)	10			
10				15			
	35			21	36		
			DENSE Gray Fine SAND With Silt, Trace Shell Fragments (SP-SM)	15			
11				16			
	40			18	34		
			DENSE Gray Fine SAND (SP)	14			
12				17			
	45			21	38		
			SOFT Gray CLAY (CH)	1			
13				1			
	50			2	3		

Boring Terminated @ 50 ft.

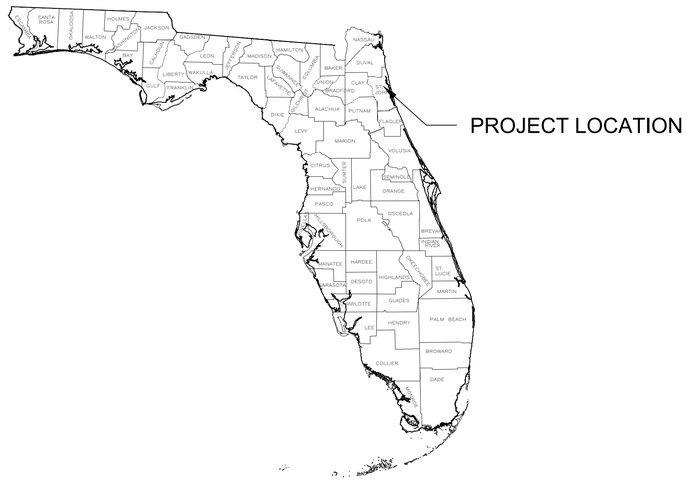
Remarks

CONSTRUCTION DRAWINGS
FOR
NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS
ST. JOHNS COUNTY, FLORIDA

PREPARED FOR:

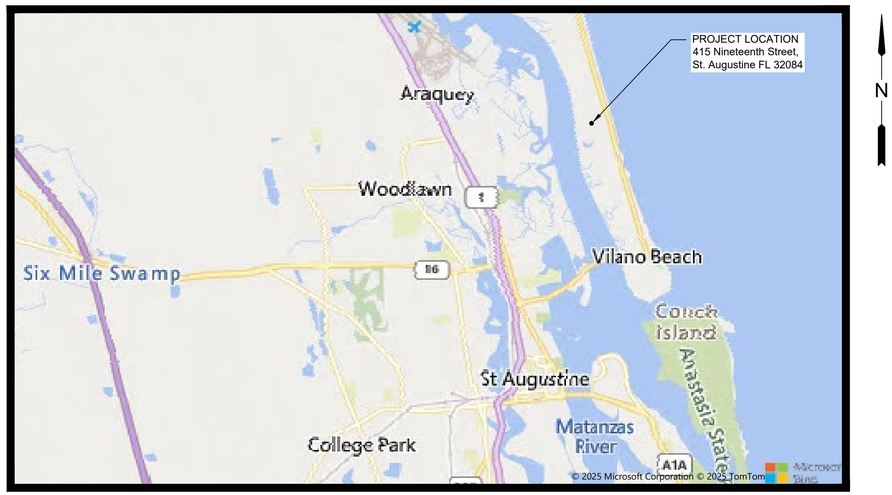
ST. JOHNS COUNTY UTILITY DEPARTMENT

PROJECT NO 4488-56302-XXXX-56302



VICINITY MAP

MM PROJECT
NO. 502101130-015



LOCATION MAP
SCALE: NTS

MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Road Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

JUNE 2026
100% SUBMITTAL

This document is issued for the party which commissioned it and for specific purposed connected with the captioned project only. It should not be relied upon by any other party or used for any other purpose
We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to us by other parties.

PROJECT NOTES:

1. CONTRACTOR SHALL FOLLOW SJCUD'S MANUAL OF WATER, WASTEWATER, AND REUSE DESIGN STANDARDS AND SPECIFICATIONS, LATEST VERSION, AND THE PROJECT'S SPECIFICATIONS DURING CONSTRUCTION. CONTRACTOR SHALL USE A REQUEST FOR INFORMATION IN THE EVENT OF A DISCREPANCY.
2. ELEVATIONS SHOWN HEREON ARE RELATIVE TO THE NATIONAL GEODETIC VERTICAL DATUM OF NAVD 1988 AND ARE BASED ON BENCHMARKS AS SHOWN ON THE SURVEY.
3. THE CONTRACTOR IS RESPONSIBLE FOR PROCURING ALL MOBILIZATION, STORAGE, AND STAGING AREAS AS WELL AS ACCESS TO THE CONSTRUCTION SITES WITHIN THE RIGHT OF WAYS AND APPROVED SJCUD EASEMENT AREAS. EROSION CONTROL DEVICES AND BEST MANAGEMENT PRACTICES SHALL BE INSTALLED AND MAINTAINED AT ALL WORK SITES AND STAGING AREAS. THE CONTRACTOR SHALL FOLLOW ALL LOCAL GUIDELINES AND REGULATIONS REGARDING THE WORK, INCLUDING KEEPING MUD AND DIRT OFF PUBLIC ROADS, PRIVATE ENTRANCES, AND SJCUD EASEMENT AREAS.
4. ALL UNDERGROUND PIPING SHALL BE RESTRAINED.
5. FOR ALL TIE-IN PIPING, CROSSINGS, OR VALVES, THE CONTRACTOR SHALL VERIFY ALL EXISTING PIPELINE ELEVATIONS, LOCATIONS, DIAMETERS, AND MATERIALS PRIOR TO SHOP DRAWING SUBMITTALS AND RELEASE OF MATERIALS, NOTIFYING THE ENGINEER OF ANY CONFLICTS.
6. THE CONTRACTOR SHALL PERMANENTLY RESTORE THE IMPACTED ROADWAY TO SJC STANDARDS WEEKLY, AT A MINIMUM. THE MAXIMUM LENGTH OF TEMPORARY BASE COURSE MATERIAL IN PLACE AT A TIME IS LIMITED TO 500 LF.
7. DISTURBANCE SHALL BE LIMITED TO SJCUD PROPERTY, PUBLIC ROW, AND SJCUD EASEMENTS.
8. THE CONTRACTOR SHALL CONTACT SJCUD'S OFFICE IMMEDIATELY UPON FINDING ANY CONFLICTS DURING CONSTRUCTION OF ANY IMPROVEMENTS SHOWN ON THE DRAWINGS.
9. ANY PUBLIC LAND CORNER, PROPERTY MONUMENTATION, OR BENCHMARK WITHIN THE LIMITS OF CONSTRUCTION SHALL BE PROTECTED. IF A MONUMENT IS IN DANGER OF BEING DESTROYED, THE CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY. ANY CORNER MONUMENT OR LANDMARKS DISTURBED OR DESTROYED SHALL BE RESET BY A PROFESSIONAL LAND SURVEYOR LICENSED IN THE STATE OF FLORIDA AT NO ADDITIONAL COST TO THE OWNER.
10. PAVEMENT, DRIVEWAYS, AND SIDEWALKS SHALL BE REMOVED BY FULL DEPTH SAW CUTTING IN STRAIGHT, VERTICAL LINES.
11. THE CONTRACTOR SHALL, BY REPAIR OR REPLACEMENT, RETURN TO EQUAL OR BETTER CONDITION ALL PAVEMENT, CURB, SIDEWALK, LAWNS, LANDSCAPING, UTILITIES AND OTHER ITEMS DAMAGED BY THE CONSTRUCTION ACTIVITY.
12. ALL BRUSH, STRIPPED, OR UNSUITABLE MATERIAL SHALL BE DISPOSED OF OFF-SITE AT THE CONTRACTOR'S EXPENSE.
13. NO REPRESENTATION IS MADE REGARDING BALANCED EARTHWORK. ANY EXCESS MATERIAL, OR MATERIAL NOT SUITABLE FOR USE AS BACKFILL, SHALL BE HAULED AWAY TO AN APPROVED DISPOSAL SITE AT THE CONTRACTOR'S EXPENSE, AND WHERE NECESSARY, SUITABLE FILL AND BACKFILL SHALL BE PROVIDED AND NO ADDITIONAL COMPENSATION SHALL BE ALLOWED.
14. SUBMITTAL OF AS-BUILT SITE SURVEY, INCLUDING BENCHMARKS, IS REQUIRED PRIOR TO SCHEDULING FINAL INSPECTION. AS-BUILT SURVEY SHALL BE SIGNED AND SEALED BY A REGISTERED LAND SURVEYOR IN THE STATE OF FLORIDA AND SHALL INCLUDE COORDINATES OF ALL NEW STRUCTURES, ALL PIPE FITTINGS AND VALVES 4-INCH AND LARGER AND ELEVATIONS OF ALL NEW PIPES, VALVES AND FITTINGS 4-INCH AND LARGER, IN ACCORDANCE WITH SJCUD STANDARDS.
15. THE CONTRACTOR SHALL NOTE ALL EXISTING UTILITIES ENCOUNTERED DURING EXCAVATION AND INCLUDE LOCATION, DEPTH, CONDUIT DIAMETER AND MATERIAL, AND UTILITY FUNCTION ON AS-BUILT DRAWINGS.
16. CONTRACTOR SHALL CLEARLY PHOTOGRAPH THE ENTIRE SITE PRIOR TO AND AFTER RESTORATION. CONTRACTOR SHALL DOCUMENT AND SUBMIT THESE RECORDS TO SJCUD AND THE ENGINEER.
17. ST. JOHNS COUNTY INSPECTOR SHALL BE CONTACTED 24 HOURS PRIOR TO ALL NECESSARY SITE WORK INSPECTIONS AND 5 DAYS PRIOR TO THE FINAL INSPECTION.
18. ALL WORK SHALL BE PERFORMED BETWEEN 7:00 A.M. AND 5:00 P.M., MONDAY THROUGH FRIDAY. THE CONTRACTOR JUNE PERFORM WORK OUTSIDE OF REGULAR WORKING HOURS, WEEKENDS, AND/OR HOLIDAYS ONLY AFTER RECEIVING WRITTEN CONSENT FROM SJCUD AND SJC. THE CONTRACTOR IS REQUIRED TO PROVIDE A WRITTEN REQUEST TO SJCUD, SJC, AND THE ENGINEER 2 WEEKS PRIOR TO SCHEDULING WORK OUTSIDE OF REGULAR WORKING HOURS.
19. THE CONTRACTOR SHALL NOTIFY SJCUD, SJC, AND THE ENGINEER OF ANY ROAD CLOSURES A MINIMUM OF TWO WEEKS PRIOR TO SCHEDULING WORK.

EXISTING UTILITY PROTECTION:

1. IN ORDER TO REDUCE THE DISRUPTION AND COST OF UTILITY DAMAGES OCCURRING IN THE POTABLE SYSTEM AND SJC RIGHT-OF-WAY, THE CONTRACTOR SHALL PREVENT DAMAGES TO EXISTING UTILITIES CAUSED BY HIS WORK THROUGH FIELD VERIFICATION OF THE LOCATION OF THE EXISTING UTILITIES. IN THE CASE OF DIRECTIONAL DRILLING AND/OR JACI AND AUGER BORE CONSTRUCTION, VERIFICATION SHALL TAKE PLACE PRIOR TO MOBILIZATION OF THE DRILLING EQUIPMENT.
2. THE CONTRACTOR SHALL VERIFY THE LOCATION OF EXISTING UTILITIES AS NEEDED TO AVOID CONTACT. EXISTING UTILITIES SHALL BE EXPOSED USING DETECTION EQUIPMENT OR OTHER ACCEPTABLE MEANS. SUCH METHODS JUNE INCLUDE BUT SHALL NOT BE LIMITED TO "SOFT DIG" EQUIPMENT AND GROUND PENETRATING RADAR (GPR). THE EXCAVATOR SHALL BE HELD LIABLE FOR DAMAGES CAUSED TO THE SJC'S/SJCUD'S INFRASTRUCTURE AND THE EXISTINC FACILITIES OF OTHER UTILITY COMPANIES.
3. LOCATIONS, ELEVATIONS, AND DIMENSIONS OF EXISTING UTILITIES, STRUCTURES, AND OTHER FEATURES ARE SHOWN ACCORDING TO THE BEST INFORMATION AVAILABLE AT THE TIME OF PREPARATION OF THESE PLANS, BUT DO NOT PURPORT TO BE ABSOLUTELY CORRECT. IT SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR TO PHYSICALLY VERIFY, LOCATE, AND AVOID ALL UTILITIES, INFRASTRUCTURE, OTHER STRUCTURES AND OBSTRUCTIONS BOTH ABOVE AND BELOW GROUND SURFACE PRIOR TO CONSTRUCTION AND DURING CONSTRUCTION. ALL DAMAGE RESULTING FROM THE CONTRACTOR'S FAILURE TO COMPLY WITH THIS REQUIREMENT SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE.
4. THE CONTRACTOR SHALL NOTIFY THE ENGINEER AND SJCUD OF ANY DISCREPANCIES.
5. THE CONTRACTOR SHALL NOTIFY SJCUD AND SUNSHINE ONE-CALL (811) AT LEAST 72 HOURS PRIOR TO DIGGING IN ANY PORTION OF THE PROJECT. CONTRACTOR SHALL COORDINATE WITH ALL UTILITY OWNERS, INCLUDING FPL, PRIOR TO PERFORMING WORK NEAR EXISTING ITS UTILITIES.

GENERAL LEGEND

	EXISTING	PROPOSED
RIGHT OF WAY LINE		
CHAINLINK FENCE (HEIGHT & MAT'L. INDICATED)	6' CLF	
SPOT ELEVATION	+3.4	+4.3
CONTROL POINT (NUMBER INDICATED)	CP-XX	
GROUNDWATER MONITORING WELL	GW-XX	
SIGN - TYPE INDICATED	OR SIGN	
BUSH, SHRUB OR HEDGE	SHRUB	
SILT BERM		
SILT FENCE		
TREE, SIZE & TYPE INDICATED	12" O	
MAIL BOX	MB	
WTP PROPERTY LINE		
POST (AS NOTED)		
BOLLARD/POST (AS NOTED)		
TRENCH AND REPAIR TO SJC STANDARDS		
DIRT/GRAVEL DRIVEWAY RESTORATION		
ASPHALT/CONCRETE RESTORATION		
DEMOLITION		

- = SET 5/8" IRON ROD - LB # 8177
- = FOUND 5/8" IRON ROD - # 4793
- = FOUND 1/2" IRON PIPE - LB # 4921
- = FOUND 1/2" IRON ROD - # 894
- = FOUND 5/8" IRON ROD - LB # 4690
- = FOUND 1/2" IRON PIPE - NO IDENTIFICATION
- = FOUND 3/4" IRON PIPE - NO IDENTIFICATION
- = FOUND 5/8" IRON ROD - NO IDENTIFICATION

BM #1 = BENCHMARK # 1 - NAIL AND DISK IN PAVEMENT ELEVATION 4.33 FEET NAVD 1988

BM #2 = BENCHMARK # 2 - NAIL AND DISK IN PAVEMENT ELEVATION 5.15 FEET NAVD 1988

BM #3 = BENCHMARK #3 - NAIL AND DISK IN PAVEMENT ELEVATION 4.66 FEET NAVD 1988

BM #4 = BENCHMARK #4 - NAIL AND DISK IN PAVEMENT ELEVATION 4.10 FEET NAVD 1988

BM #5 = BENCHMARK #5 - NAIL AND DISK IN CONCRETE HEADWALL ELEVATION 6.38 FEET NAVD 1988

TEMPORARY PAVEMENT AND "DROP-OFF" RESTORATION

1. WHEN DROP-OFFS OCCUR WITHIN THE CLEAR ZONE DUE TO CONSTRUCTION, CONTRACTOR SHALL FOLLOW FDOT INDEX 102-600 AND SPECIFICATIONS BELOW TO MAINTAIN A SMOOTH DRIVING SURFACE AT THE END OF EACH WORK PERIOD. THE CONTRACTOR SHALL SUBMIT ITS PLAN FOR THIS WORK TO SJC, SJCUD, AND THE ENGINEER FOR ITS APPROVAL PRIOR TO BEGINNING CONSTRUCTION.
2. AT THE END OF EACH WORK DAY, THE CONTRACTOR SHALL CUT THE DISTURBED EDGE OF PAVEMENT TO A NEAT, VERTICAL EDGE. THE CONTRACTOR SHALL BACKFILL AND COMPACT, PER SJC STANDARDS, THE AREA WHERE THE PAVEMENT HAS BEEN REMOVED AND THE GRASSED SHOULDER THAT HAS BEEN TRENCHED. THE TOP 1-FOOT OF THE TRENCH SHALL BE TEMPORARILY BACKFILLED AND COMPACTED TO EXISTING GRADE WITH A BASE COURSE COMPOSED OF ONE OF THE OPTIONAL BASE MATERIALS PER FDOT SPECIFICATIONS SECTION 285 IN THE ORIGINAL PAVEMENT AREA AND 3-FEET INTO THE GRASSED SHOULDER.
3. THE EDGE OF THE TRENCH WHERE THE EDGE OF PAVEMENT STRIPING CURRENTLY EXISTS SHALL BE LINED WITH MOT/TTC REFLECTIVE BARRELS TO DELINEATE THE ORIGINAL EDGE OF PAVEMENT.
4. CONTRACTOR SHALL CONDUCT DAILY INSPECTIONS FOR DEFICIENCIES RELATED TO EROSION, EXCESSIVE SLOPES, RUTTING, OR OTHER ADVERSE CONDITIONS. CONTRACTOR SHALL REPAIR ANY DEFICIENCIES IMMEDIATELY.
5. ADDITIONALLY, THE CONTRACTOR SHALL USE COLD PATCH ASPHALT OR HOT MIX ASPHALT FOR TEMPORARY PAVEMENT RESTORATION WHEN THE ROADWAY IS DISTURBED, SUCH AS WHEN THE PROPOSED PIPELINE IS WITHIN THE ROADWAY, OR WHEN REQUIRED BY SJC.
6. THE CONTRACTOR SHALL RETURN THE ROAD SHOULDER TO ITS ORIGINAL GRASSED CONDITION AND ELEVATION WHEN REMOVING ANY TEMPORARY PAVEMENT.
7. THIS WORK, INCLUDING ALL COSTS FOR THE PLACEMENT AND REMOVAL OF THE TEMPORARY BASE MATERIALS, SHALL BE ACCOUNTED FOR IN THE PIPING BID ITEM. NO SEPARATE BID ITEM IS INCLUDED FOR THIS WORK IN THE BID FORM.

UTILITY CONTACTS:

A. UNITI FIBER ~ BOB MENSCHING (BOB.MENSCHING@UNITI.COM) ---------- 904-718-8152
B. COMCAST UTILITY ~ JAMES GRAHAM (JAMES_GRAHAM@COMCAST.COM) ---------- 904-509-6472
C. ST. JOHNS COUNTY - RIGHT-OF-WAY PERMITTING ~ RICK MAULDIN ---------- 904-209-0134
D. ST. JOHNS COUNTY - TRAFFIC SIGNALS ~ HANK MEIN ---------- 904-209-0173
E. AT&T EAST DISTRICT ~ PK PATEL (PP5963@ATT.COM) ---------- 904-699-4976
F. AT&T DISTRICT MANAGER ~ RICK MARINO (RX4884@ATT.COM) ---------- 352-238-1882
G. TECO GAS UTILITY ~ JOAN DOMNING (JDOMNING@TECOENERGY.COM) ---------- 813-275-3783
H. FPL - JONATHAN HURST (JONATHAN.HURST@FPL.COM) ---------- 904-837-6476
I. ST. JOHNS COUNTY - PLANT OPERATOR - GLEN SANDERS (GSANDERS@SJCFL.US) -- 904-814-9523

ABBREVIATIONS

R/W	= RIGHT OF WAY
LB	= LICENSED BUSINESS
CONC	= CONCRETE
(R)	= RECORD
(M)	= MEASURED
PP	= POWER POLE
LP	= LIGHT POLE
GP	= GUARD POST
OHW	= OVERHEAD WIRE(S)
GWA	= GUY WIRE ANCHOR
BFP	= BACK FLOW PREVENTER
WVCB	= WATER VALVE CONTROL BOX
WV	= WATER VALVE
TOV	= TOP OF VALVE
HYD	= FIRE HYDRANT
WM	= WATER METER
EM	= ELECTRIC METER
T	= TELEPHONE RISER
ESB	= ELECTRIC SERVICE BOX
CPP	= CORRUGATED PLASTIC PIPE
MB	= MAIL BOX
FLP	= FLAG POLE
IV	= IRRIGATION VALVE
SV	= SEWER VALVE
CMP	= CORRUGATED METAL PIPE
ECMP	= ELLIPTICAL CORRUGATED METAL PIPE
ERCP	= ELLIPTICAL REINFORCED CONCRETE PIPE
MES	= MITERED END SECTION
A/C	= AIR CONDITIONER

UTILITY LEGEND

BC	BACK OF CURB ELEVATION
	BENCHMARK
	BOLLARD
CLF	CHAIN LINK FENCE
--REC--	RECLAIMED WATER MAIN
--COMM--	COMMUNICATION LINE
	CONCRETE POWER POLE
DIP	DUCTILE IRON PIPE
	LIGHT POLE
EP	EDGE OF PAVEMENT ELEVATION
E	ELECTRIC HANDHOLE
E	ELECTRIC MANHOLE
EM	ELECTRIC METER
ERCP	ELLIPTICAL REINFORCED CONCRETE PIPE
	FENCE
	FIBER OPTIC CABLE MARKER
FO	FIBER OPTIC HANDHOLE
	FIRE HYDRANT
FM	FORCE MAIN
--G--	GAS LINE
	GAS MARKER
	GAS VALVE
	MAILBOX
	MONITORING WELL
PM	PARKING METER
PED	PEDESTRIAN WALK SIGNAL POLE
PVC	POLYVINYL CHLORIDE PIPE
	PVC STAND PIPE
RWM	RECLAIMED WATER MAIN
RCP	REINFORCED CONCRETE PIPE
S	SANITARY SEWER MANHOLE
	SANITARY SEWER VALVE
	SIGN
D	STORM SEWER MANHOLE
	SET NAIL & DISK STAMPED LB4603
T	TELEPHONE MANHOLE
T	TELEPHONE RISER
	TRAFFIC SIGNAL MAST ARM BASE
TH	TRAFFIC SIGNAL HANDHOLE
--UGE--	UNDERGROUND ELECTRIC LINE
--W--	WATER LINE
W	WATER MANHOLE
	WATER MARKER
WM	WATER METER
	WATER VALVE
	WOOD POWER POLE
!	UNKNOWN MANHOLE

DETAIL SYMBOLS

A / CD-1 — A = DETAIL LETTER; CD-1 = SHEET DETAIL IS ON

DETAIL CALLOUT
(DETAILS WILL BE LETTERS)

SECTION CUT SYMBOLS

/ XX-XXX — # = SECTION NUMBER; XX-XXX = SHEET SECTION IS SHOWN ON (if shown on same sheet is cut from then replace with hyphen)

SECTION CALLOUT
(SECTIONS WILL BE NUMBERS)

DRAWING, SECTION AND DETAIL TITLES:

PLAN TITLE
NTS

1 / MD-2 NTS — SECTION TITLE
1 = SECTION NUMBER; MD-2 = SHEET SECTION IS CUT ON. (if section is on the sheet it is cut on then it will be replaced with a hyphen)

SECTION TITLE
(SECTIONS WILL BE NUMBERS)

A / MD-1 NTS — DETAIL TITLE
A = DETAIL LETTER; MD-1 = SHEET DETAIL IS TAKEN FROM. (if detail is in multiple places then show a hyphen)

DETAIL TITLE
(DETAILS WILL BE LETTERS)

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E-1 TO E-13, ED-1 TO ED-6, I-1 TO I-12, ID-1

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MOTT MACDONALD — Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	S. ALIX
DRAWN BY:	B. LEE
DATE:	JUNE 2026
CHECKED BY:	C. TUCKER
DATE:	JUNE 2026

DESIGN ENGINEER
CALE MADDEN, P.E.
FLORIDA REGISTRATION NO.
88379

ST. JOHNS COUNTY UTILITY DEPARTMENT
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

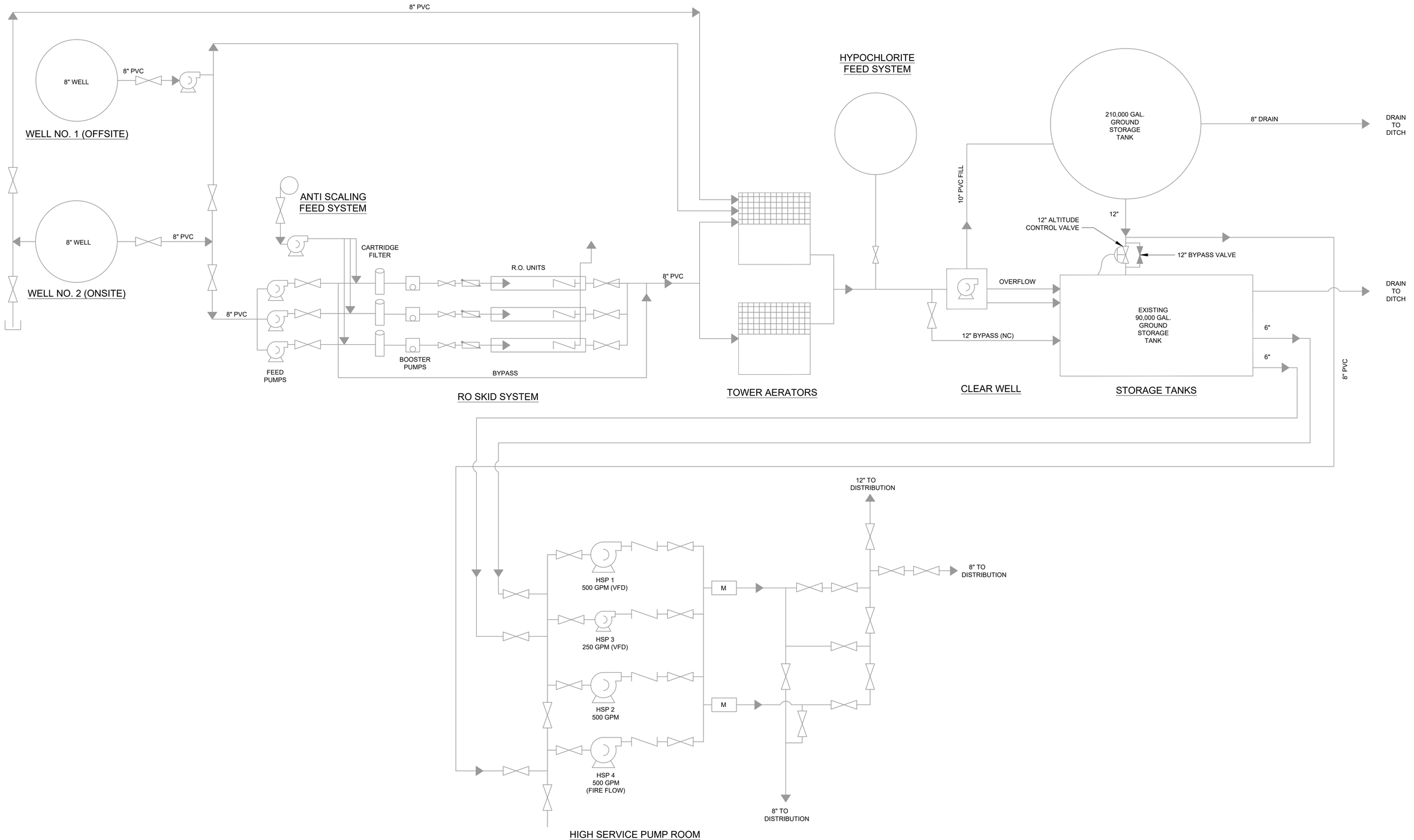
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

GENERAL NOTES AND DRAWING INDEX

SHEET NO. 1
DWG NO. G-1
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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	S. ALIX
DRAWN BY:	B. LEE
DATE:	JUNE 2026
CHECKED BY:	C. TUCKER
DATE:	JUNE 2026

DESIGN ENGINEER
CALE MADDEN, P.E.
FLORIDA REGISTRATION NO.
88379

St. Johns County
Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

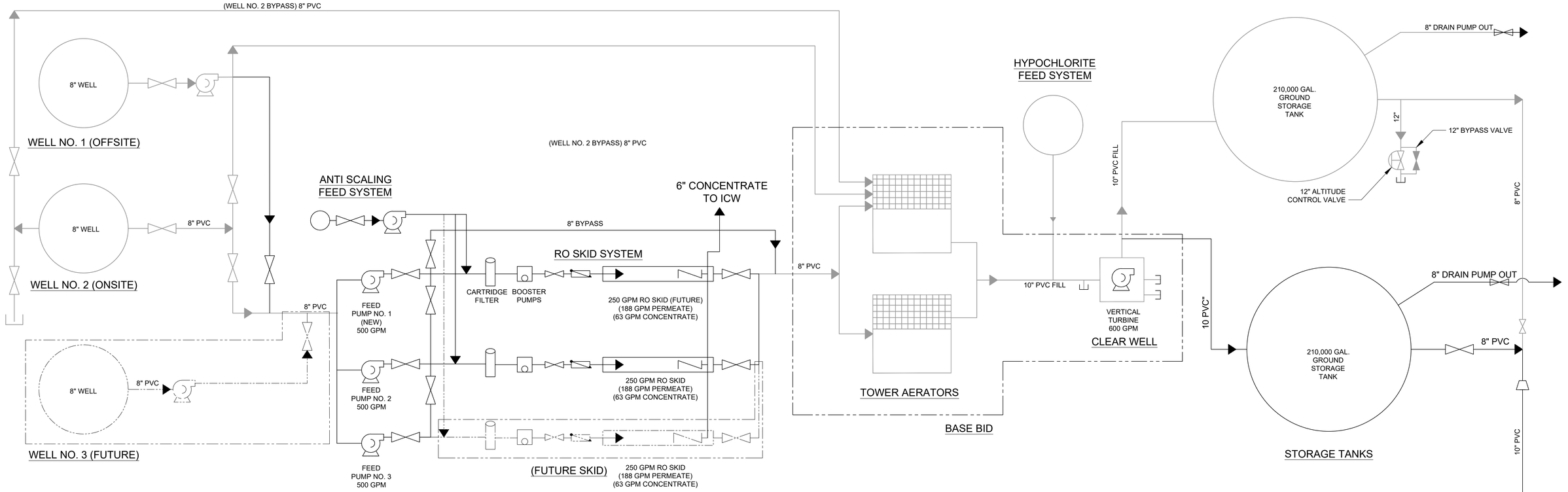
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

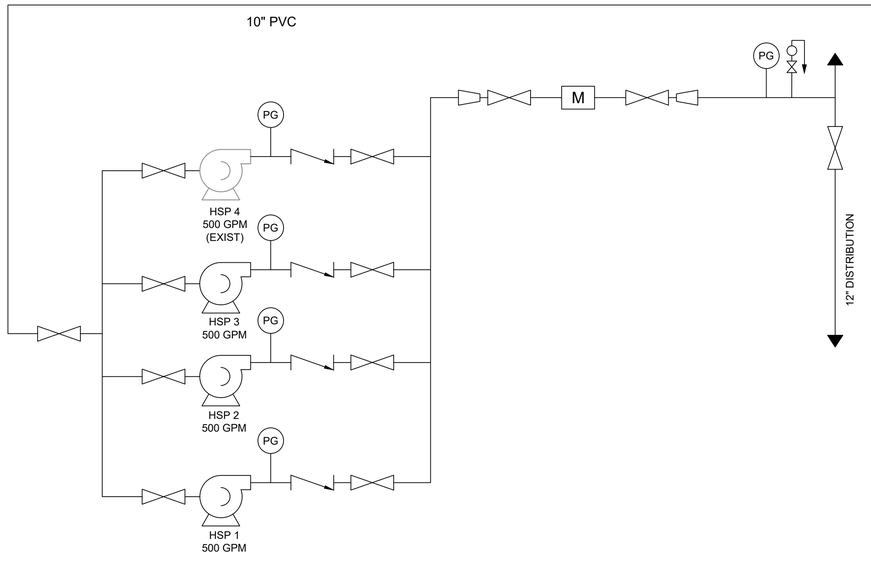
EXISTING PROCESS FLOW DIAGRAM

SHEET NO. 2
DWG NO. G-2
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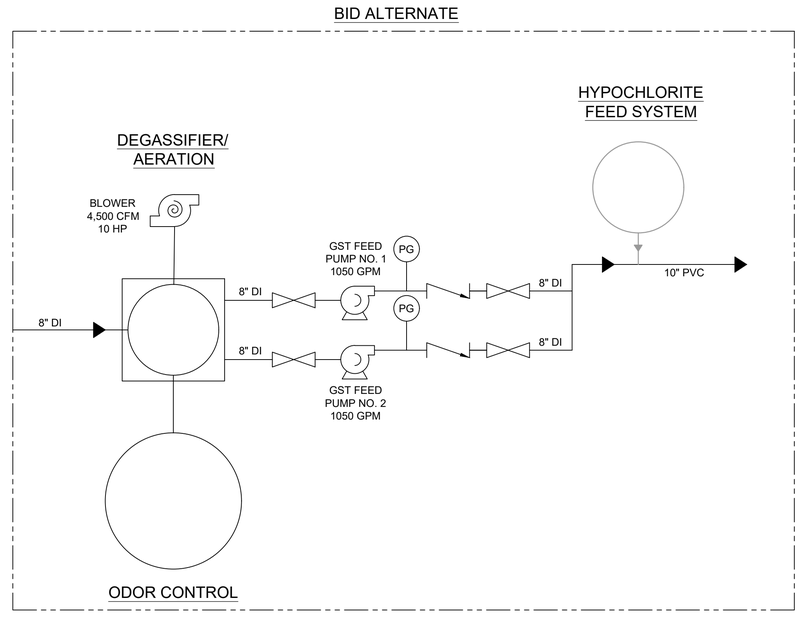
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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	S. ALIX
DRAWN BY:	B. LEE
DATE:	JUNE 2026
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DESIGN ENGINEER
CALE MADDEN, P.E.
FLORIDA REGISTRATION NO.
88379

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

PROPOSED PROCESS FLOW DIAGRAM

SHEET NO. 3
DWG NO. G-3
100% SUBMITTAL

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Xrefs Attached= SJCUD_22X34_BOR [..\Xrefs\SJCUD_22X34_BOR.dwg]

TREE TABLE				
TREE NO.	DIA. (IN.)	SPECIES	REMOVE/PRESERVE	PROTECTED
T1	16 (6" TREE VALUE)	CABBAGE PALM	PRESERVE	YES
T2	17	PINE	PRESERVE	NO
T3	9	LIVE OAK	PRESERVE	YES
T4	9	LIVE OAK	PRESERVE	YES
T5	14	LIVE OAK	REMOVE	YES
T6	10	LIVE OAK	REMOVE	YES
T7	10	LIVE OAK	REMOVE	YES
T8	10	LIVE OAK	PRESERVE	YES
T9	10	LIVE OAK	PRESERVE	YES
T10	12	LIVE OAK	PRESERVE	YES
T11	10	LIVE OAK	PRESERVE	YES
T12	12	LIVE OAK	PRESERVE	YES
T13	13	LIVE OAK	PRESERVE	YES
T14	18	LIVE OAK	PRESERVE	YES
T15	4	LIVE OAK	PRESERVE	YES
T16	15	LIVE OAK	REMOVE	YES
T17	16	LIVE OAK	PRESERVE	YES
T18	9	LIVE OAK	PRESERVE	YES
T19	9	LIVE OAK	PRESERVE	YES
T20	12 (6" TREE VALUE)	CABBAGE PALM	PRESERVE	YES
T21	8	LIVE OAK	PRESERVE	YES
T22	16	LIVE OAK	REMOVE *	YES
T23	8	LIVE OAK	REMOVE *	YES
T24	6	LIVE OAK	REMOVE *	YES
T25	8	LIVE OAK	REMOVE *	YES
T26	10	LIVE OAK	REMOVE *	YES
T27	6	LIVE OAK	REMOVE *	YES
T28	16	LIVE OAK	REMOVE *	YES
T29	21	PINE	REMOVE *	NO
T30	7	PINE	REMOVE *	NO
T31	10	LIVE OAK	REMOVE *	YES
T32	28	LIVE OAK	REMOVE *	YES
T33	9	LIVE OAK	REMOVE *	YES
T34	10	LIVE OAK	REMOVE	YES
T35	9	LIVE OAK	REMOVE	YES
T36	17	LIVE OAK	REMOVE	YES
T37	9	LIVE OAK	REMOVE	YES
T38	12	LIVE OAK	REMOVE	YES
T39	6	LIVE OAK	PRESERVE	YES
T40	10	LIVE OAK	PRESERVE	YES
T41	9	LIVE OAK	PRESERVE	YES
T42	9	LIVE OAK	PRESERVE	YES
T43	12	LIVE OAK	PRESERVE	YES
T44	7	LIVE OAK	PRESERVE	YES
T45	7	LIVE OAK	PRESERVE	YES
T46	14	LIVE OAK	PRESERVE	YES
T47	10	LIVE OAK	PRESERVE	YES
T48	12	LIVE OAK	PRESERVE	YES
T49	8	LIVE OAK	PRESERVE	YES
T50	20	LIVE OAK	PRESERVE	YES
T51	8	LIVE OAK	PRESERVE	YES
T52	11	LIVE OAK	PRESERVE	YES
T53	6	LIVE OAK	PRESERVE	YES
T54	7	LIVE OAK	PRESERVE	YES
T55	7	LIVE OAK	PRESERVE	YES
T56	14	LIVE OAK	PRESERVE	YES
T57	6	LIVE OAK	PRESERVE	YES
T58	9	LIVE OAK	PRESERVE	YES
T59	4	LIVE OAK	PRESERVE	YES
T60	4	LIVE OAK	PRESERVE	YES
T61	8	LIVE OAK	PRESERVE	YES
T62	7	LIVE OAK	PRESERVE	YES
T63	6	LIVE OAK	PRESERVE	YES
T64	6	LIVE OAK	PRESERVE	YES
T65	7	LIVE OAK	PRESERVE	YES
T66	5	LIVE OAK	PRESERVE	YES
T67	6	LIVE OAK	PRESERVE	YES
T68	4	LIVE OAK	PRESERVE	YES
T69	9	LIVE OAK	PRESERVE	YES
T70	5	LIVE OAK	PRESERVE	YES
T71	7	LIVE OAK	PRESERVE	YES
T72	11	LIVE OAK	REMOVE	YES
T73	12	LIVE OAK	REMOVE	YES
T74	10	LIVE OAK	REMOVE	YES
T75	10	LIVE OAK	REMOVE	YES
T76	14	LIVE OAK	REMOVE	YES
T77	9	LIVE OAK	REMOVE	YES
T78	8	LIVE OAK	REMOVE	YES
T79	6	LIVE OAK	REMOVE	YES
T80	10	LIVE OAK	REMOVE	YES
T81	14	LIVE OAK	REMOVE	YES
T82	7	LIVE OAK	PRESERVE	YES
T83	6	LIVE OAK	PRESERVE	YES
T84	6	LIVE OAK	PRESERVE	YES
T85	12	LIVE OAK	PRESERVE	YES
T86	9	LIVE OAK	PRESERVE	YES
T87	5	LIVE OAK	PRESERVE	YES
T88	8	LIVE OAK	PRESERVE	YES
T89	5	LIVE OAK	PRESERVE	YES
T90	12	LIVE OAK	PRESERVE	YES
T91	14	LIVE OAK	PRESERVE	YES
T92	15	LIVE OAK	PRESERVE	YES
T93	7	LIVE OAK	PRESERVE	YES
T94	7	LIVE OAK	PRESERVE	YES
T95	3	HOLLY	PRESERVE	NO
T96	12	LIVE OAK	PRESERVE	YES
T97	3	HOLLY	PRESERVE	NO
T98	7	LIVE OAK	PRESERVE	YES
T99	8	LIVE OAK	PRESERVE	YES
T100	4	CEDAR	PRESERVE	YES

TREE TABLE (CONT.)				
TREE NO.	DIA. (IN.)	SPECIES	REMOVE/PRESERVE	PROTECTED
T101	12	MYRTLE	PRESERVE	YES
T102	8	MYRTLE	PRESERVE	YES
T103	14	MYRTLE	PRESERVE	YES
T104	3	MYRTLE	PRESERVE	NO
T105	7	LIVE OAK	PRESERVE	YES
T106	10	LIVE OAK	PRESERVE	YES
T107	7	LIVE OAK	PRESERVE	YES
T108	7	LIVE OAK	PRESERVE	YES
T109	14	LIVE OAK	PRESERVE	YES
T110	7	LIVE OAK	PRESERVE	YES
T111	6	LIVE OAK	PRESERVE	YES
T112	4	LIVE OAK	PRESERVE	YES
T113	7	LIVE OAK	PRESERVE	YES
T114	6	LIVE OAK	PRESERVE	YES
T115	5	MYRTLE	PRESERVE	NO
T116	5	MYRTLE	PRESERVE	NO
T117	7	MYRTLE	PRESERVE	NO
T118	9	MYRTLE	PRESERVE	YES
T119	7	MYRTLE	PRESERVE	NO
T120	13 (6" TREE VALUE)	CABBAGE PALM	PRESERVE	YES
T121	4	QUEEN PALM	PRESERVE	NO
T122	13	LIVE OAK	PRESERVE	YES
T123	4	SUMAC	PRESERVE	NO
T124	5	QUEEN PALM	PRESERVE	NO
T125	10	LIVE OAK	PRESERVE	YES
T126	9	LIVE OAK	PRESERVE	YES
T127	8	LIVE OAK	PRESERVE	YES
T128	6	MYRTLE	PRESERVE	NO
T129	6	MYRTLE	PRESERVE	NO
T130	4	MYRTLE	PRESERVE	NO
T131	8	LIVE OAK	PRESERVE	YES
T132	5	MYRTLE	PRESERVE	NO
T133	5	MYRTLE	PRESERVE	NO
T134	11	LIVE OAK	PRESERVE	YES
T135	2	MYRTLE	REMOVE	NO
T136	5	LIVE OAK	REMOVE	YES
T137	4	LIVE OAK	REMOVE	YES
T138	2	HOLLY	REMOVE	NO
T139	8	LIVE OAK	REMOVE	YES
T140	5	MYRTLE	REMOVE	NO

* - TREES T22 THROUGH T33 WERE PREVIOUSLY APPROVED FOR REMOVAL AND ARE NOT INCLUDED IN THE TOTAL TREE INCHES CALCULATION.

GENERAL NOTES:

1. CONTRACTOR SHALL REFER TO SECTION 01014 CONSTRUCTION SEQUENCING PRIOR TO COMMENCING ANY DEMOLITION WORK.
2. THE PLANT SHALL STAY FULLY OPERATIONAL DURING THE IMPROVEMENTS. REFER TO SHEET C-2 FOR GST NO. 2 LOCATION. GST 2 SHALL BE CONNECTED TO THE EXISTING SYSTEM WITH ALL PRESSURE AND TESTING REQUIREMENTS COMPLETED.
3. THE EXISTING RECTANGULAR STORAGE TANK SHALL BE DEMOLISHED PRIOR TO ALL OTHER DEMOLITION SHOWN. CONTRACTOR SHALL IDENTIFY THE EFFLUENT PIPING AND VALVES TO ENSURE PROPER ISOLATION PRIOR TO DEMOLITION. CONTRACTOR TO COORDINATE WITH SJCUD OPERATIONS TO TURN VALVES AT HSP MANIFOLD FOR GST NO. 1 AND 2 TO FEED ALL HSPS.
4. DEMOLITION OF THE EXISTING TREATMENT BUILDING SHALL NOT BEGIN UNTIL THE NEW TREATMENT BUILDING IS FULLY OPERATIONAL.
5. PRIOR TO RELOCATING THE EXISTING OFFSITE WELL PUMP, CONTRACTOR SHALL IDENTIFY ISOLATION VALVES AND COORDINATE WITH SJCUD PRIOR TO SHUT DOWN.
6. REFER TO SHEET C-1 FOR BID ALTERNATE DEMOLITION REQUIRED. CONTRACTOR SHALL REVIEW SECTION 01014 CONSTRUCTION SEQUENCE PRIOR TO COMMENCING WITH BID ALTERNATE SITE LAYOUT.

REQUIRED TREE INCHES: AREA

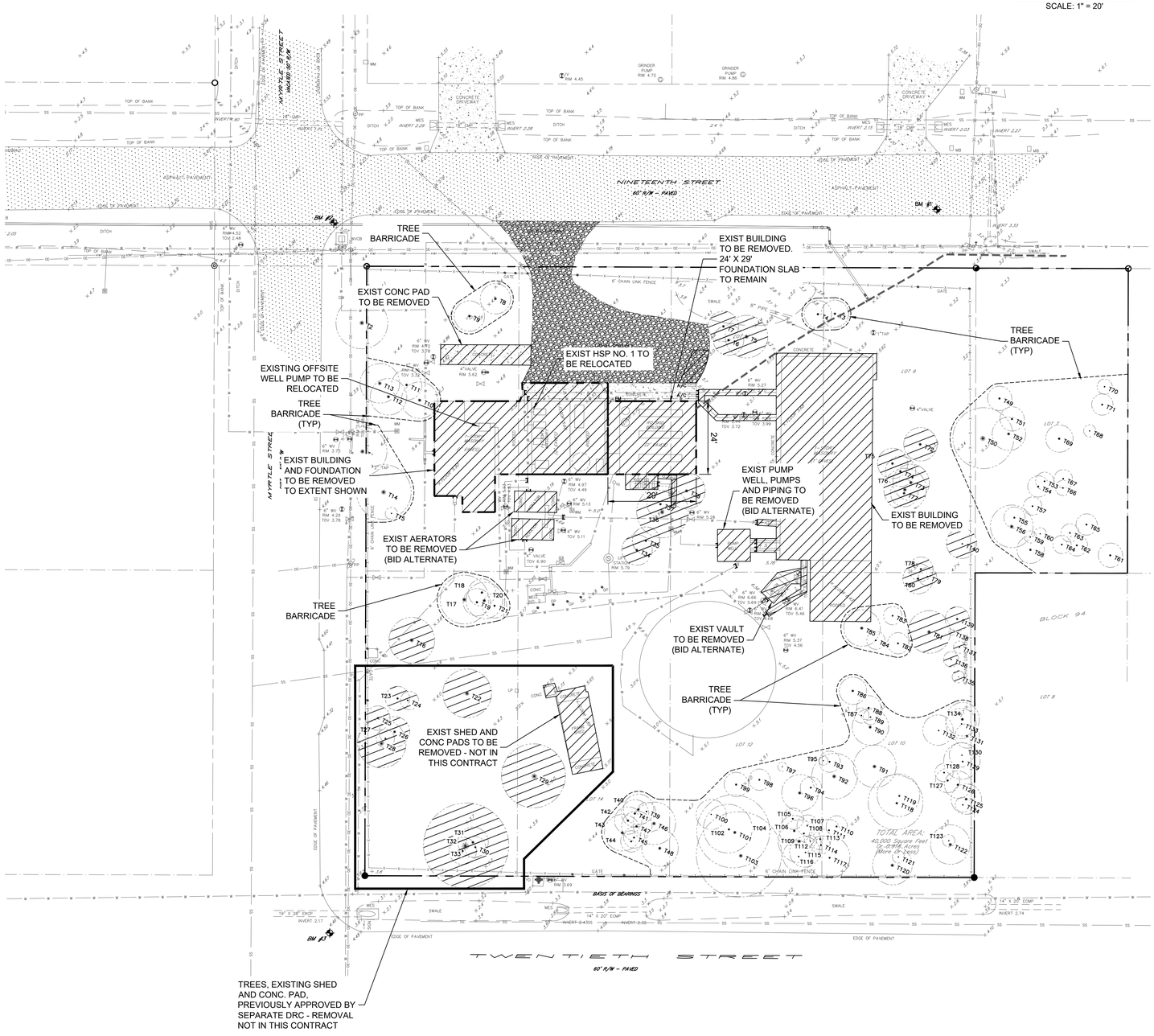
Lot Area Requirements (1 Acres @ 40"/Acre)	Inches
Project Site 1.03" Acres @ 40"/Acre=	42.0
Preserved Protected Tree Inches:	758
Removed Protected Tree Inches:	227
Remaining Protected Tree Inches:	531

MITIGATION

Tree Fund Requirements ($100/Removed Protected Tree Inches)

227 Removed Protected Tree Inches @ $100/Inch = $22,700

40 Inches/Acre Requirement is Satisfied



NO.	BY	DATE	SYMBOL	REVISIONS
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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	S. ALIX
DRAWN BY:	B. LEE
DATE:	JUNE 2026
CHECKED BY:	C. TUCKER
DATE:	JUNE 2026

DESIGN ENGINEER
CALE MADDEN, P.E.
FLORIDA REGISTRATION NO.
88379

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

EXISTING SITE AND DEMOLTION PLAN

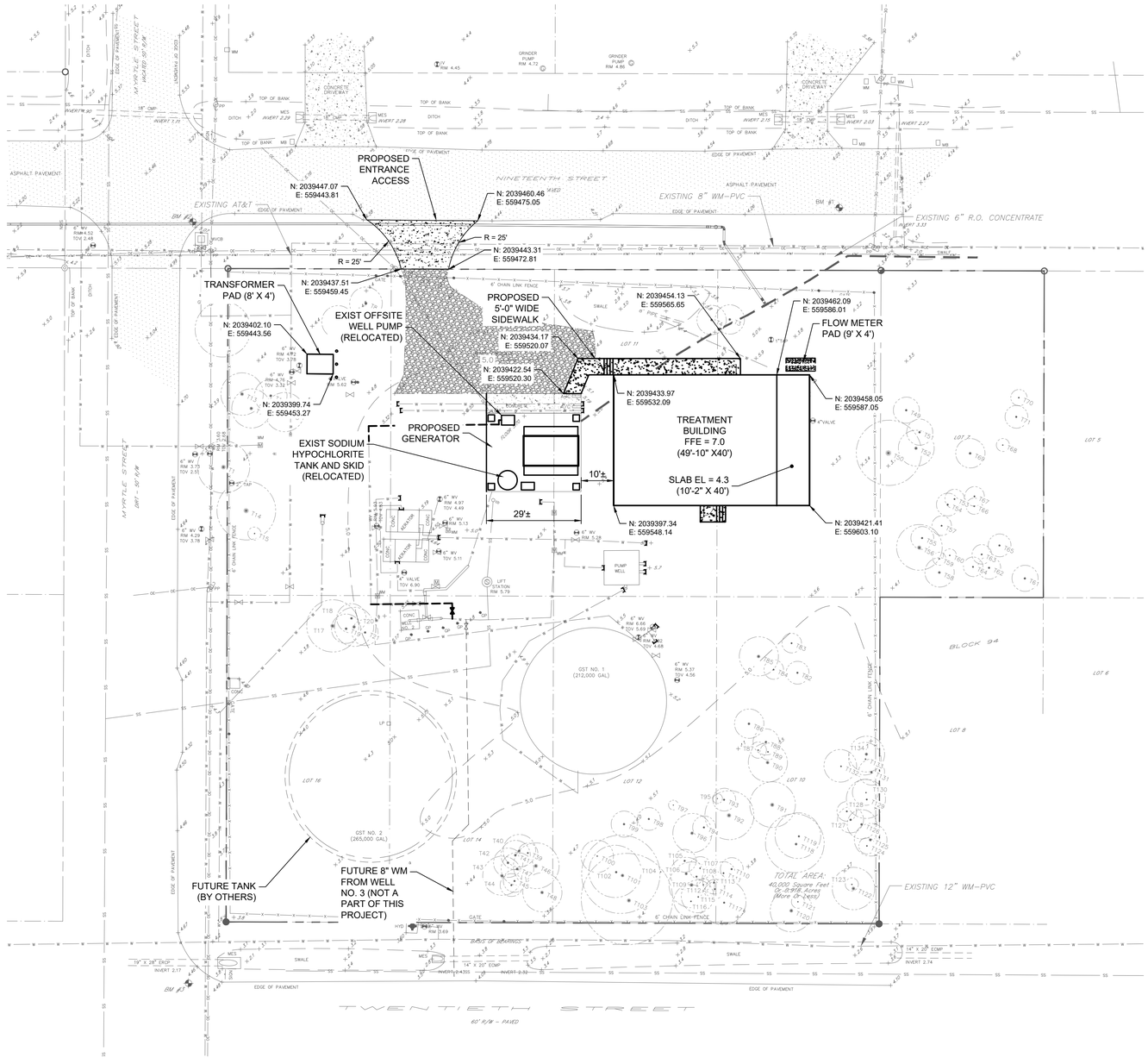
SHEET NO. 4
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SITE CHARACTERISTICS				
COVERAGE TYPE	EXISTING (SF)	DEMOLISHED (SF)	PROPOSED (SF)	POST DEVELOPMENT TOTALS (SF)
BUILDINGS	2,260	1,221	2,400	3,439
CONCRETE	5,247	3,462	4,573	6,358
ASPHALT				0
GRAVEL	1,837	64	0	1,773
TOTAL IMPERVIOUS AREA	7,507	4,683	6,973	6,973
OPEN TOP TANKAGE	0	0	0	0
OPEN AREA	37,493			38,027
TOTAL AREA	45,000	0	0	45,000
WETLANDS	0	0	0	0
TOTAL AREA EXCLUDING WETLANDS	45,000			45,000
% IMPERVIOUS COVERAGE (INCLUDING OPEN TOP TANKAGE	16.68%			15.50%
% IMPERVIOUS COVERAGE EXCLUDING WETLANDS	16.68%			15.50%

SITE DEVELOPMENT REGULATIONS	
PARCEL NUMBER	146154-0090
FUTURE LAND USE DESIGNATION	RESIDENTIAL-C
ZONING DISTRICT	RS-3
REQUIRED YARDS	25/8/10 FEET F/S/R
PROPOSED YARDS	25/8/10 FEET F/S/R
MAXIMUM BUILDING HEIGHT	35 FEET
PROPOSED BUILDING HEIGHT	BUILDING 20FT/ AERATOR 25 FT
MAXIMUM FAR	N/A
PROPOSED FAR	7.64%
MAXIMUM IMPERVIOUS SURFACE RATIO	70%
PROPOSED IMPERVIOUS SURFACE RATIO	15.50%





0 20 40

SCALE: 1" = 20'

GENERAL NOTES:

1. CONTRACTOR SHALL COORDINATE WITH FPL FOR ALL ELECTRICAL SERICE INSTALLATION REQUIREMENTS, INCLUDING THE SERVCE TRANSFORMER, PAD, METERING, AND ALL ASSOCIATED EQUIPMENT.
2. CONTRACTOR SHALL COORDINATE SITE ACCESS WITH SJCUD OPERATORS AS TO NOT IMPACT PLANT DAILY OPERATION. THE CONTRACTOR SHALL BE RESPONSIBLE TO REPAIR ANY DAMAGE THAT OCCURS AS A RESULT OF THEIR OPERATIONS/WORKFORCE, AT NO ADDITIONAL COST TO THE OWNER. ALL REPAIRS SHALL BE MADE TO RESTORE THE FENCING, GATE, AND/OR ASSOCIATED EQUIPMENT TO THE SAME OR BETTER CONDITION THAN CURRENTLY EXISTS.

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NO.	BY	DATE	SYMBOL	REVISIONS
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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	S. ALIX
DRAWN BY:	B. LEE
DATE:	JUNE 2026
CHECKED BY:	C. TUCKER
DATE:	JUNE 2026

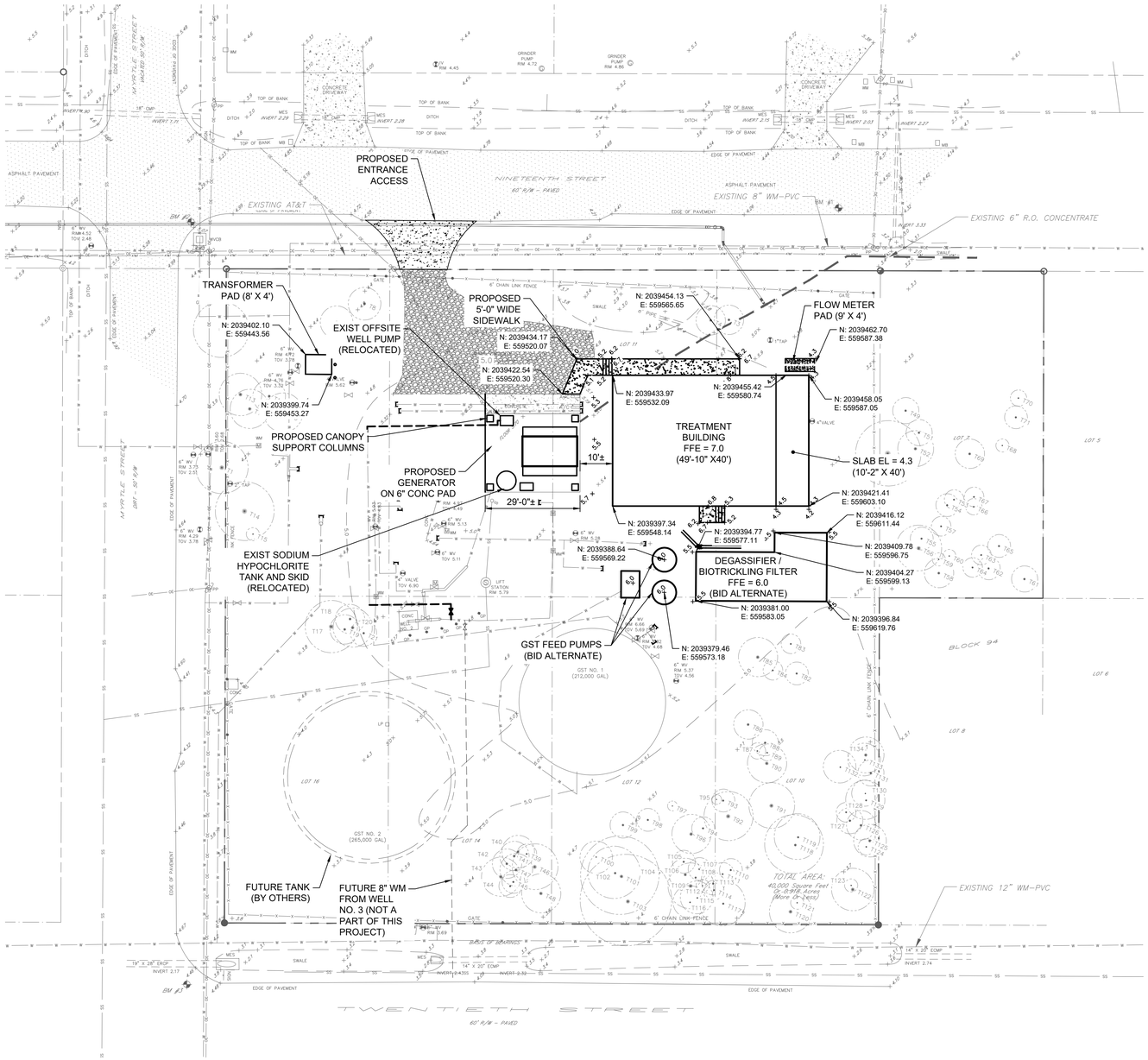
DESIGN ENGINEER
CALE MADDEN, P.E.
FLORIDA REGISTRATION NO.
88379

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

PROPOSED SITE LAYOUT

SHEET NO. 5
DWG NO. C-2
100% SUBMITTAL



0 20 40

SCALE: 1" = 20'

GENERAL NOTES:

1. REFER TO SHEET C-1 FOR BID ALTERNATE DEMOLITION REQUIRED. CONTRACTOR SHALL REVIEW SECTION 01014 CONSTRUCTION SEQUENCE PRIOR TO COMMENCING WITH BID ALTERNATE SITE LAYOUT.

NO.	BY	DATE	SYMBOL	REVISIONS
6.				
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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	S. ALIX
DRAWN BY:	B. LEE
DATE:	JUNE 2026
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DATE:	JUNE 2026

DESIGN ENGINEER
CALE MADDEN, P.E.
FLORIDA REGISTRATION NO.
88379

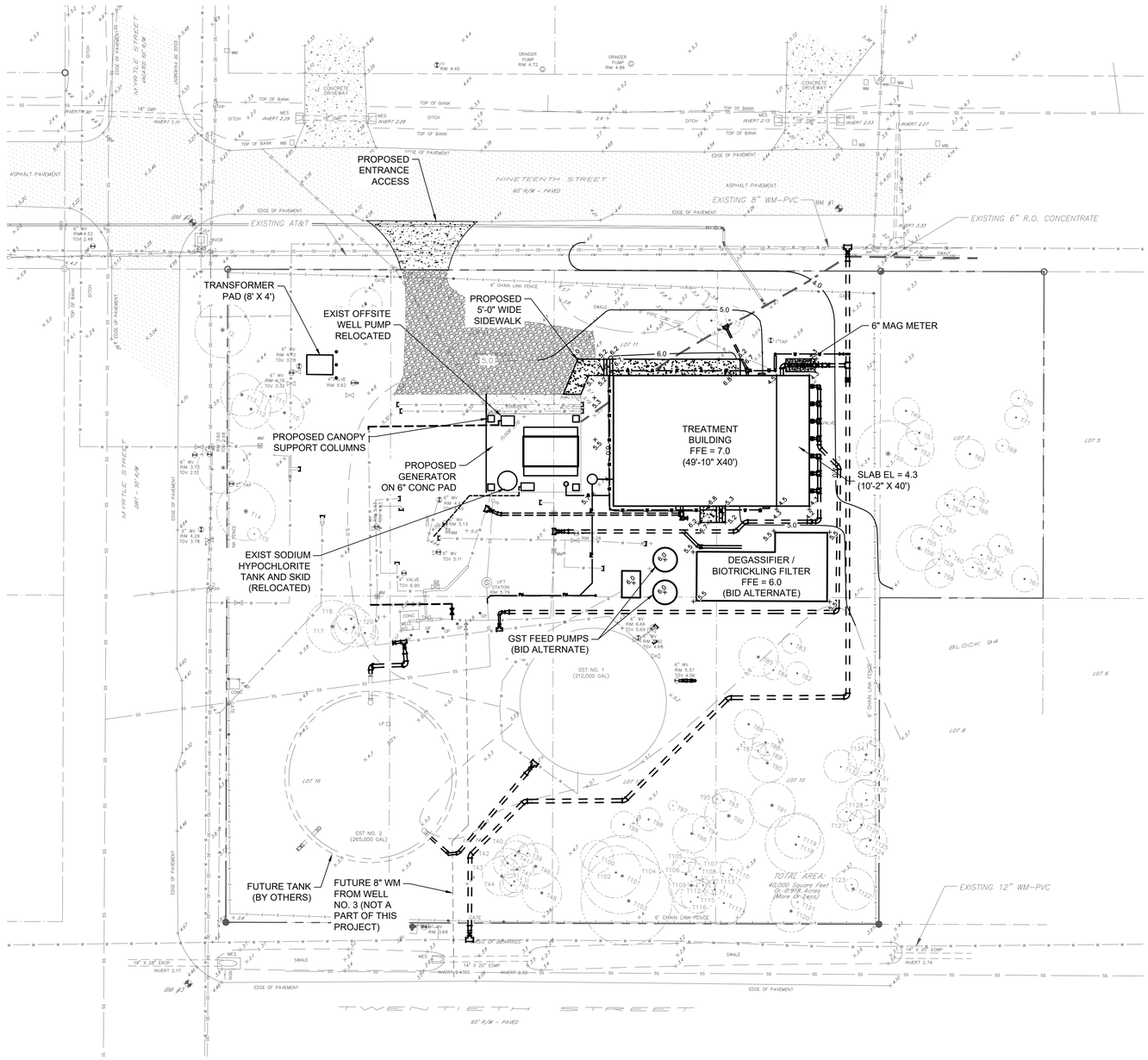
St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

PROPOSED SITE LAYOUT
(BID ALTERNATE)

SHEET NO. 6
DWG NO. C-3
100% SUBMITTAL

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SCALE: 1" = 20'

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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	S. ALIX
DRAWN BY:	B. LEE
DATE:	JUNE 2026
CHECKED BY:	C. TUCKER
DATE:	JUNE 2026

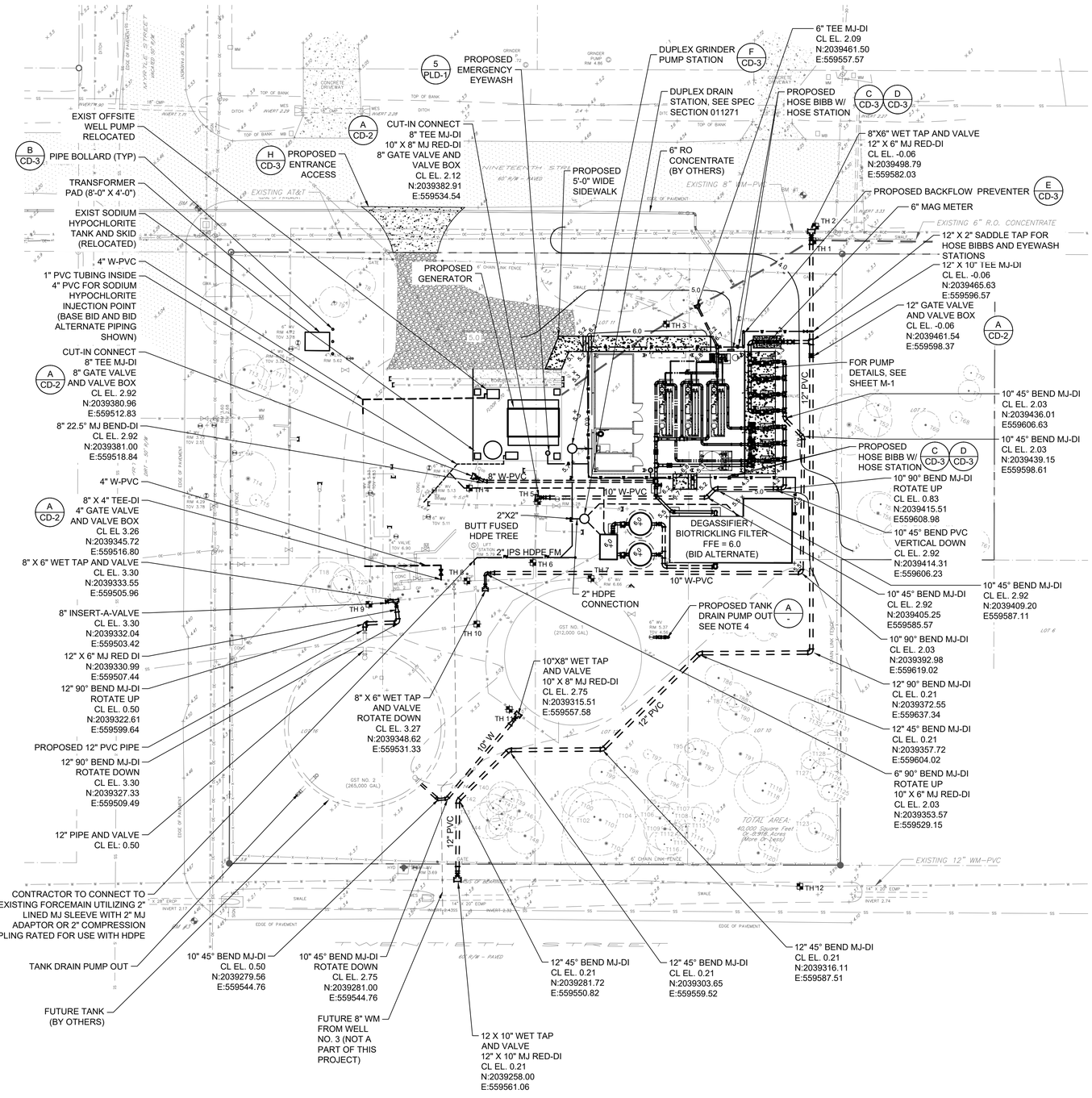
DESIGN ENGINEER
CALE MADDEN, P.E.
FLORIDA REGISTRATION NO.
88379

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

PROPOSED GRADING AND DRAINAGE PLAN

SHEET NO. 7
DWG NO. C-4
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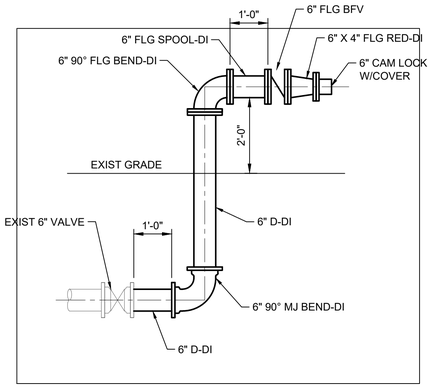


0 20 40

SCALE: 1" = 20'

NOTES:

1. THE INFLUENT AND EFFLUENT CONNECTION FOR THE NEW GST NO. 2 WILL BE INSTALLED WITH A WET TAP TO THE EXISTING LINE AS SHOWN IN ORDER TO KEEP THE PLANT OPERATIONAL DURING IMPROVEMENTS. CONTRACTOR SHALL COORDINATE OPERATIONS WITH SJCUD PRIOR TO SCHEDULING. THE 8-INCH INSERT-A-VALVE SHALL BE INSTALLED DURING THE SAME TIME.
2. CUT-IN CONNECTIONS SHALL BE PREFORMED FOR THE INFLUENT AND EFFLUENT CONNECTION TO THE EXISTING RAW WELL WATER AND RO PERMEATE PIPES. CONTRACTOR SHALL COORDINATE SHUT DOWN WITH SJCUD OPERATIONS.
3. THE NEW TREATMENT BUILDING SHALL BE OPERATIONAL PRIOR TO RELOCATING ANY EXISTING EQUIPMENT OR PUMPS WITHIN THE EXISTING BUILDING.
4. CONTRACTOR TO FIELD LOCATE 6-INCH DRAIN VALVE. DRAIN LINE SHALL BE ABANDONED AND THE VALVE WILL BE NEW LOCATION FOR TANK PUMP OUT.
5. PRIOR TO RELOCATING THE EXISTING OFFSITE WELL PUMP, CONTRACTOR SHALL IDENTIFY ISOLATION VALVES AND COORDINATE WITH SJCUD PRIOR TO SHUT DOWN.



A - TANK DRAIN PUMP OUT

SCALE: 1/2" = 1'-0"

TEST HOLE LOCATIONS

No.	NORTHING	EASTING	GR ELEV	TOP PIPE ELEV	PIPE MATERIAL
TH 1	2039496.174	559583.841	3.52	0.8	6"PVC NPW
TH 2	2039500.865	559582.68	3.61	0.31	8" PVC WM
TH 3	2039451.987	559550.788	5.33	2.09	6"PVC NPW
TH 4	2039376.921	559513.23	5	3.3	8"PVC WM
TH 5	2039381.825	559535.446	4.22	2.5	8"PVC WM
TH 6	2039362.97	559542.085	5.01	2.15	8"PVC WM
TH 7	2039365.838	559561.576	5.48	3.63	8"PVC WM
TH 8	2039348.799	559524.7	4.8	3.64	8"PVC WM
TH 9	2039328.942	559498.376	4.61	3.68	8"PVC WM
TH 10	2039337.183	559533.308	4.88	1.44	4"PVC SAN
TH 11	2039315.837	559554.248	5.42	3.21	10"PVC WM
TH 12	2039300.987	559664.6	3.55	0.76	12"PVC WM

NO.	BY	DATE	SYMBOL	REVISIONS
6.				
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AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
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DESIGN ENGINEER
CALE MADDEN, P.E.
FLORIDA REGISTRATION NO.
88379

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

PROPOSED YARD PIPING PLAN

SHEET NO. 8
DWG NO. C-5
100% SUBMITTAL

Xrefs Attached= SJCUD_22X34_B0R_FM [..\Xrefs\SJCUD_22X34_B0R.dwg]
Xref-Prop-Layout [..\Xrefs\Xref-Prop-Layout.dwg]
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SJCUD - North Beach WTP\Project Files\MottMac\C_Civil Engineering\Drawings\C-2.dwg

GENERAL NOTES FOR SOIL EROSION AND SEDIMENT CONTROL:

1. ALL EROSION AND SEDIMENT CONTROL PRACTICES TO BE INSTALLED PRIOR TO ANY MAJOR SOIL DISTURBANCE, OR IN THEIR PROPER SEQUENCE, AND MAINTAINED UNTIL PERMANENT PROTECTION IS ESTABLISHED.

2. ANY DISTURBED AREAS THAT WILL BE LEFT EXPOSED MORE THAN 30 DAYS, AND NOT SUBJECT TO CONSTRUCTION TRAFFIC, WILL IMMEDIATELY RECEIVE A TEMPORARY SEEDING. IF THE SEASON PREVENTS THE ESTABLISHMENT OF A TEMPORARY COVER, THE DISTURBED AREAS WILL BE MULCHED WITH STRAW, OR EQUIVALENT MATERIAL, AT A RATE OF TWO (2) TONS PER ACRE, ACCORDING TO STATE STANDARDS.

3. PERMANENT VEGETATION TO BE SEEDED OR SODDED ON ALL EXPOSED AREAS WITHIN TEN (10) DAYS AFTER GRADING. MULCH TO BE USED AS NECESSARY FOR PROTECTION UNTIL SEEDING IS ESTABLISHED.

4. ALL WORK AND MATERIALS TO BE IN ACCORDANCE WITH THE FDOT "STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION", LATEST EDITION, SECTIONS 104, 570, AND 981 TO 987.

*5. A BITUMINOUS CONCRETE BASE COURSE WILL BE APPLIED IMMEDIATELY FOLLOWING ROUGH GRADING AND INSTALLATION OF IMPROVEMENTS IN ORDER TO STABILIZE STREETS, ROADS, DRIVEWAYS AND PARKING AREAS. IN AREAS WHERE NO UTILITIES ARE PRESENT, THE BITUMINOUS CONCRETE BASE SHALL BE INSTALLED WITHIN 15 DAYS OF THE PRELIMINARY GRADING.

*6. IMMEDIATELY FOLLOWING INITIAL DISTURBANCE OR ROUGH GRADING, ALL CRITICAL AREAS SUBJECT TO EROSION (I.E. STEEP SLOPES, DRAINAGE SWALES AND ROADWAY EMBANKMENTS) WILL RECEIVE A TEMPORARY SEEDING IN COMBINATION WITH STRAW MULCH OR A SUITABLE EQUIVALENT, AT A THICKNESS OF TWO (2) TO FOUR (4) INCHES MIXED WITH THE TOP TWO (2) INCHES OF SOIL, ACCORDING TO STATE STANDARDS.

*7. ANY STEEP SLOPES AND DRAINAGE SWALES RECEIVING PIPELINE INSTALLATION WILL BE BACKFILLED AND STABILIZED DAILY, AS THE INSTALLATION PROCEEDS (I.E. SLOPES GREATER THAN 3:1).

8. UNFILTERED DEWATERING IS NOT PERMITTED. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS DURING ALL DEWATERING OPERATIONS TO MINIMIZE SEDIMENT TRANSFER.

9. SHOULD THE CONTROL OF DUST AT THE SITE BE NECESSARY, THE SITE WILL BE SPRINKLED UNTIL THE SURFACE IS WET, TEMPORARY VEGETATION COVER SHALL BE ESTABLISHED OR MULCH SHALL BE APPLIED IN ACCORDANCE WITH STATE STANDARDS FOR EROSION CONTROL.

10. ALL SOIL WASHED, DROPPED, SPILLED OR TRACKED OUTSIDE THE LIMIT OF DISTURBANCE OR ONTO PUBLIC RIGHTS-OF-WAY WILL BE REMOVED IMMEDIATELY.

11. ALL SOIL STOCKPILES ARE TO BE TEMPORARILY STABILIZED IN ACCORDANCE WITH SOIL EROSION AND SEDIMENT CONTROL NOTE NUMBER 2 (ABOVE).

12. ALL SEDIMENTATION STRUCTURES SHALL BE INSPECTED AND MAINTAINED REGULARLY.

*13. THE CONTRACTOR SHALL PREPARE A PLAN FOR THE PROPER DEWATERING AND DOWNSTREAM SILTATION PROTECTION OF EACH STREAM CROSSING PRIOR TO EXCAVATING THE STREAM BED. PLAN SHALL BE FORWARDED TO THE ENGINEER FOR APPROVAL. THE ENGINEER SHALL BE NOTIFIED FOR INSPECTION PRIOR TO EACH STREAM CROSSING CONSTRUCTION.

14. ANY AREAS USED FOR THE CONTRACTOR'S STAGING, INCLUDING BUT NOT LIMITED TO, TEMPORARY STORAGE OF STOCKPILED MATERIALS (E.G. CRUSHED STONE, QUARRY PROCESS STONE, SELECT FILL, EXCAVATED MATERIALS, ETC.), SHALL BE ENTIRELY PROTECTED BY A SILT FENCE ALONG THE LOW ELEVATION SIDE TO CONTROL SEDIMENT RUNOFF.

* WHERE APPLICABLE

TEMPORARY SEEDING DETAILS

SEED BED PREPARATION
SOIL TO BE THOROUGHLY PULVERIZED BY DISK-HARROWING AND BE LOOSE AND REASONABLY SMOOTH. APPLY FERTILIZER AT A RATE OF 260 LBS/ACRE OF 16-16-16 OR EQUIVALENT, APPLY DOLOMITIC LIMESTONE AT A RATE OF 800 TO 1000 LBS./ACRE TO PROVIDE A SOIL pH OF 5.5 TO 6.5, LIME & FERTILIZER TO BE WORKED INTO THE TOPSOIL TO A DEPTH OF 4". ADD SANDY LOAM TOPSOIL TO A MINIMUM OF TWO (2) INCHES WHERE DIRECTED BY ENGINEER.

SEED MIXTURE
CONSISTING OF ANNUAL RYE (LOLIUM MULTIFLORUM) AT A RATE OF 174 LBS/ACRE.

PERMANENT SEEDING DETAILS

SEED BED PREPARATION
SOIL TO BE THOROUGHLY PULVERIZED BY DISK-HARROWING AND BE LOOSE AND REASONABLY SMOOTH. APPLY FERTILIZER AT A RATE OF 260 LBS/ACRE OF 16-16-16 OR EQUIVALENT, APPLY DOLOMITIC LIMESTONE AT A RATE OF 800 TO 1000 LBS./ACRE TO PROVIDE A SOIL pH OF 5.5 TO 6.5, LIME & FERTILIZER TO BE WORKED INTO THE TOPSOIL TO A DEPTH OF 4".

SEED MIXTURE CONSISTING OF	RATE	PURITY	GERMINATION
ARGENTINE BAHIA	260 LBS/AC.	95%	80%
PENSACOLA BAHIA	260 LBS/AC.	95%	40%(MIN.)-80%(TOTAL)

SODDING

SOD SHALL BE WELL ROOT MATTED ARGENTINE BAHIA GRASS COMMERCIALLY CUT TO A MINIMUM DIMENSION OF 12" x 24" A MAXIMUM OF 72 HOURS PRIOR TO PLACEMENT. SOD SHALL BE LIVE, FRESH AND UNINJURED, REASONABLY FREE OF WEEDS AND OTHER GRASSES, WITH A HEAVY SOIL MAT ADHERING TO THE ROOT SYSTEM. SOD SHALL BE GROWN, CUT, AND SUPPLIED BY A STATE CERTIFIED GROWER.

TREE PROTECTION

1. DAMAGED TRUNKS OR EXPOSED ROOTS WILL BE PAINTED IMMEDIATELY WITH A COMMERCIAL GRADE OF "TREE PAINT".

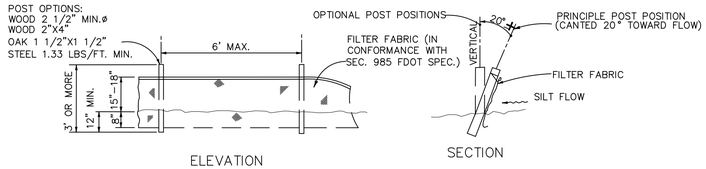
2. TREE LIMB REMOVAL, WHERE NECESSARY, WILL BE DONE FLUSH TO TRUNK OR MAIN BRANCH AND THAT AREA PAINTED IMMEDIATELY WITH A COMMERCIAL GRADE OF TREE PAINT.

DUST CONTROL

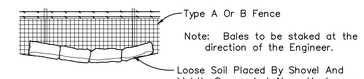
1. ALL AREAS OF CLEARING AND EMBANKMENT AS WELL AS CONSTRUCTION HAUL ROADS SHALL BE TREATED AND MAINTAINED IN SUCH A MANNER AS TO MINIMIZE ANY DUST GENERATION.

2. DISTURBED AREAS SHALL BE MAINTAINED IN A ROUGH GRADED CONDITION AND TEMPORARILY SEEDED AND/OR MULCHED UNTIL PROPER WEATHER CONDITIONS EXIST FOR THE ESTABLISHMENT OF PERMANENT VEGETATION COVER.

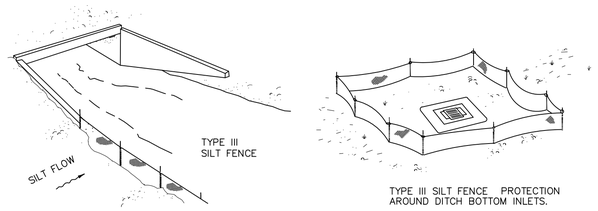
3. IN EVENT OF EMERGENCY CONDITIONS, TILLAGE WILL BE SATISFACTORY FREE BEFORE SOIL BLOWING STARTS.



A TYPE III SILT FENCE
NTS

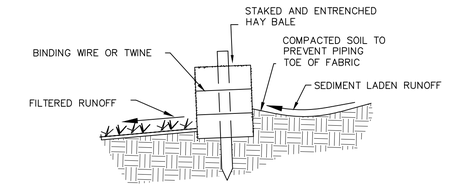


B BALES BACKED BY FENCE
NTS

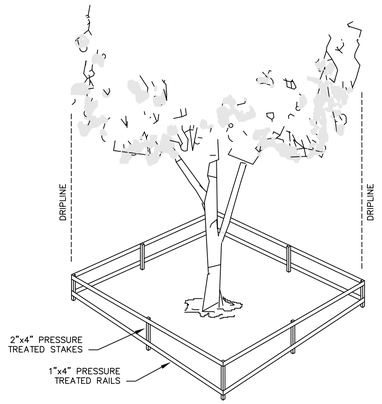


C SILT FENCE APPLICATIONS
NTS

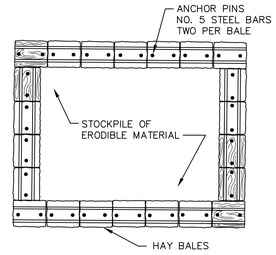
DO NOT DEPLOY IN A MANNER THAT SILT FENCES WILL ACT AS A DAM ACROSS PERMANENT FLOWING WATERCOURSES. SILT FENCES ARE TO BE USED AT UPLAND LOCATIONS AND TURBIDITY BARRIERS USED AT PERMANENT BODIES OF WATER.



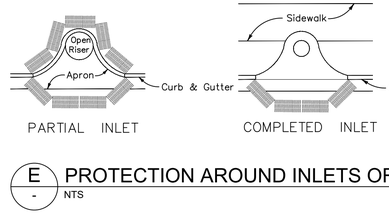
D DETAIL OF PROPERLY INSTALLED HAY BALE
NTS



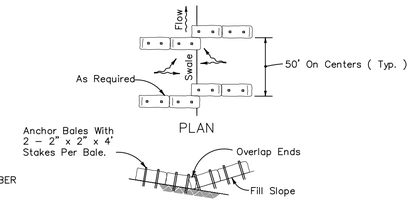
F TREE BARRICADE
NTS

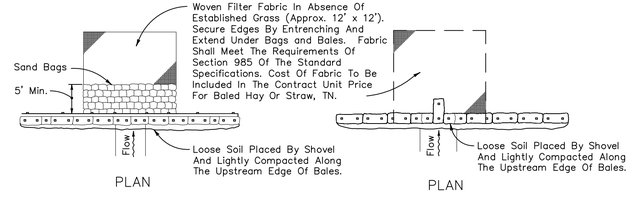


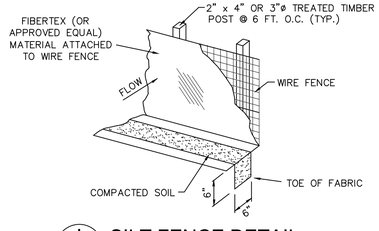
G MATERIAL STOCKPILE DETAIL
NTS



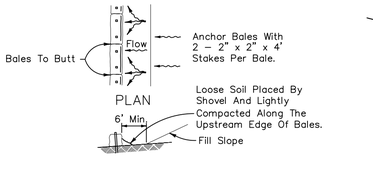
E PROTECTION AROUND INLETS OR SIMILIAR STRUCTURES
NTS



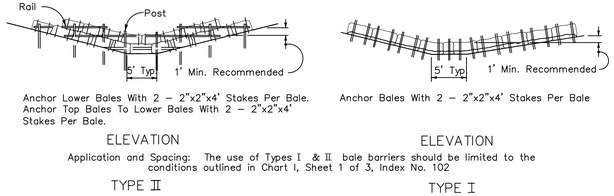




I SILT FENCE DETAIL
NTS

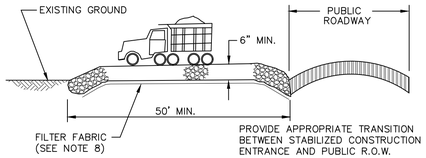


J BARRIER FOR FILL SLOPES
NTS



Application and Spacing: The use of Types I & II bale barriers should be limited to the conditions outlined in Chart I, Sheet 1 of 3, Index No. 102

K BARRIER FOR UNPAVED DITCHES
NTS



H STABILIZED CONSTRUCTION ENTRANCE DETAIL
NTS

NO.	BY	DATE	SYMBOL	REVISIONS
6.				
5.				
4.				
3.				
2.				
1.				

MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	S. ALIX
DRAWN BY:	B. LEE
DATE:	JUNE 2026
CHECKED BY:	C. TUCKER
DATE:	JUNE 2026

DESIGN ENGINEER
CALE MADDEN, P.E.
FLORIDA REGISTRATION NO.
88379

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

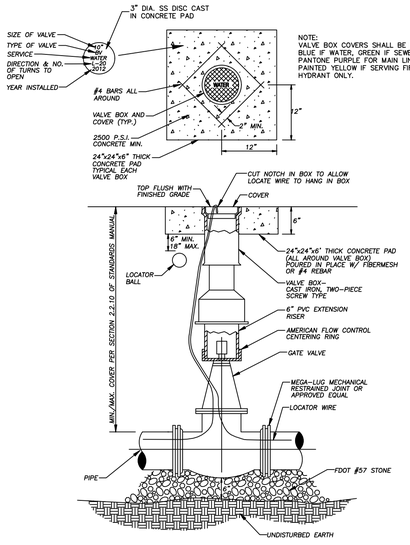
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

EROSION CONTROL DETAILS

SHEET NO. 9
DWG NO. CD-1
100% SUBMITTAL

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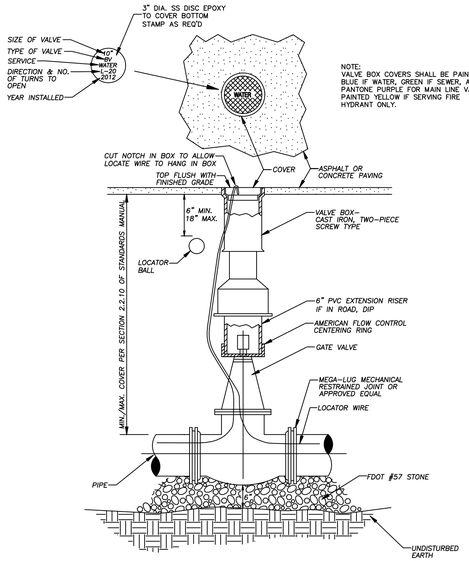
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NOTE:
VALVE BOX COVERS SHALL BE PAINTED BLUE IF WATER, GREEN IF SEWER, AND PANTONE PURPLE FOR MAIN LINE VALVE; PAINTED YELLOW IF SERVING FIRE HYDRANT ONLY.

NOTES:
1. NUT EXTENSION REQUIRED IF VALVE NUT IS DEEPER THAN 3' BELOW GRADE.
2. SS I.D. FOR ALL SIZES.
3. SCORE ¾" DEEP GROOVE IN CONCRETE PAD TO DENOTE ORIENTATION OF PIPE.
4. LOCATION OF VALVE TO BE MARKED BY LETTER "V" SCRIBED A MINIMUM OF 4" HIGH AND ¾" DEEP IN CURB AND CURB PAINTED BLUE FOR WATER, GREEN FOR SEWER, PANTONE PURPLE 522C FOR REUSE.

FOR UNPAVED LOCATIONS

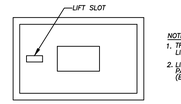


NOTE:
VALVE BOX COVERS SHALL BE PAINTED BLUE IF WATER, GREEN IF SEWER, AND PANTONE PURPLE FOR MAIN LINE VALVE; PAINTED YELLOW IF SERVING FIRE HYDRANT ONLY.

NOTES:
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2. SS I.D. FOR ALL SIZES.
3. SCORE ¾" DEEP GROOVE IN CONCRETE PAD TO DENOTE ORIENTATION OF PIPE.

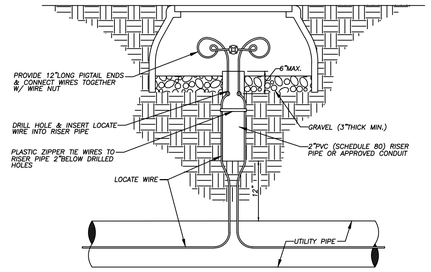
FOR PAVED LOCATIONS

A GATE VALVE & BOX 4" -16"
- NTS
SJCUD 2026
PLATE G-1/G-2



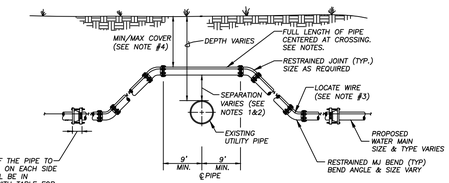
NOTES:
1. TRAFFIC RATED POLYMER CONCRETE LID. (STANDARD-NON BOLT DOWN)
2. LID COLOR SHALL BE PRE-MANUFACTURED OR PAINTED TO MATCH SERVICE. (BLUE=WATER, GREEN=SEWER, PURPLE=RECLAIM)

LID DETAIL



NOTES:
1. LOCATE WIRE STATION BOX TO BE INSTALLED WHERE THE WIRE CANNOT BE BROUGHT TO GRADE IN A VALVE BOX WITHIN THE MANDATORY 475LF INTERVAL, OR WHERE A SPLICE MUST BE MADE ON THE LOCATE WIRING. NO UNDERGROUND SPLICES.
2. BOXES SHALL NOT BE LOCATED IN ROADWAYS OR DRIVEWAYS. WHERE MAIN IS IN PAVEMENT, THE RISER PIPE SHALL BE ROUTED USING SOLVENT WELD SWEEP FITTINGS SO BOX IS A MINIMUM OF 2 FEET FROM THE EDGE OF PAVEMENT.
3. LOCATION OF LOCATE WIRE STATION TO BE MARKED BY LETTERS "LW" SCRIBED A MINIMUM 4" HIGH AND ¾" DEEP IN CURB AND CURB PAINTED BLUE FOR WATER, GREEN FOR SEWER, AND PANTONE PURPLE 522C FOR REUSE.

B LOCATE WIRE STATION DETAIL
- NTS
SJCUD 2026
PLATE G-8

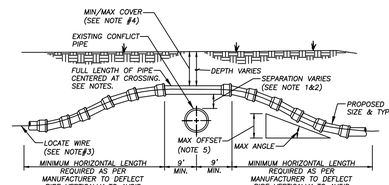


THE LENGTH OF THE PIPE TO BE RESTRAINED ON EACH SIDE OF BEND SHALL BE IN ACCORDANCE WITH TABLE FOR MECHANICAL RESTRAINT LENGTHS, (SEE RESTRAINED JOINT TABLE G-4).

TYPE "A" CROSSING
FITTING CROSSING

NOTE:
1. THE SOILS BETWEEN THE NEW MAIN AND THE CONFLICT PIPE SHALL BE COMPACTED TO 98% OF THE MAXIMUM DENSITY AS DETERMINED BY THE LABORATORY MODIFIED PROCTOR TEST, ASTM D 1557
2. FOR MINIMUM VERTICAL SEPARATION REQUIREMENTS SEE GENERAL NOTES SHEET GN-1.
3. LOCATING WIRE REQUIRED: SEE DETAIL G-8.
4. THE COVER FOR PIPING 12" OR LESS SHALL BE 30" MIN./36" MAX. IN UNPAVED AREAS AND 36" MIN./42"MAX. IN PAVED AREAS, UNLESS PRE-APPROVED BY SJCUD. THE COVER FOR PIPING 16" OR LARGER SHALL BE 42" MIN./54" MAX. IN UNPAVED AND PAVED AREAS, UNLESS PRE-APPROVED BY SJCUD. SEE SECTION 2.2.10 OF STANDARDS MANUAL.

C TYPE "A" PIPE CROSSING WITH FITTINGS
- NTS
SJCUD 2026
PLATE G-11

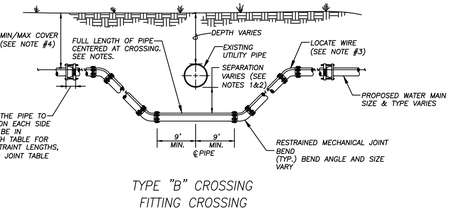


TYPE "A" CROSSING
PIPE DEFLECTION CROSSING

NOTE:
1. THE SOILS BETWEEN THE NEW MAIN AND THE CONFLICT PIPE SHALL BE COMPACTED TO 98% OF THE MAXIMUM DENSITY AS DETERMINED BY THE LABORATORY MODIFIED PROCTOR TEST, ASTM D 1557.
2. FOR MINIMUM VERTICAL SEPARATION REQUIREMENTS SEE GENERAL NOTES SHEET GN-1.
3. LOCATING WIRE REQUIRED: SEE DETAIL G-8.
4. THE COVER FOR PIPING 12" OR LESS SHALL BE 30" MIN./36" MAX. IN UNPAVED AREAS AND 36" MIN./42"MAX. IN PAVED AREAS, UNLESS PRE-APPROVED BY SJCUD. THE COVER FOR PIPING 16" OR LARGER SHALL BE 42" MIN./54" MAX. IN UNPAVED AND PAVED AREAS, UNLESS PRE-APPROVED BY SJCUD. SEE SECTION 2.2.10 OF STANDARDS MANUAL.
5. SJCUD ONLY ALLOWS 50% OF THE PIPE MANUFACTURER'S RECOMMENDATION FOR JOINT DEFLECTION. BENDING THE PIPE BARREL IS NOT ALLOWED, THE MAXIMUM ARE LISTED IN TABLE BELOW. ONLY MANUAL FORCE CAN BE UTILIZED TO OBTAIN THESE JOINT DEFLECTIONS. ALL OFFSETS ARE BASED ON MINIMUM 20LF OF PIPE LENGTH.

PVC PIPE SIZE	MAX OFFSET (20LF JOINT)
4"	19"
6"	13"
8"	10"
10"	8"
12"	7"
16" & LARGER	5"

D TYPE "A" PIPE CROSSING WITH DEFLECTION
- NTS
SJCUD 2026
PLATE G-12



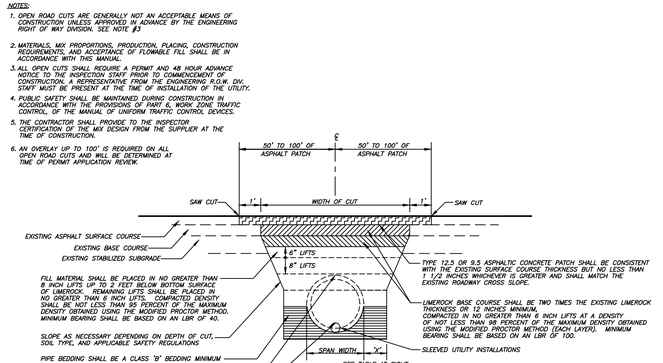
THE LENGTH OF THE PIPE TO BE RESTRAINED ON EACH SIDE OF BEND SHALL BE IN ACCORDANCE WITH TABLE FOR MECHANICAL RESTRAINT LENGTHS, (SEE RESTRAINED JOINT TABLE G-4).

TYPE "B" CROSSING
FITTING CROSSING

NOTE:
1. THE SOILS BETWEEN THE NEW MAIN AND THE CONFLICT PIPE SHALL BE COMPACTED TO 98% OF THE MAXIMUM DENSITY AS DETERMINED BY THE LABORATORY MODIFIED PROCTOR TEST, ASTM D 1557
2. FOR MINIMUM VERTICAL SEPARATION REQUIREMENTS SEE GENERAL NOTES SHEET GN-1.
3. LOCATING WIRE REQUIRED: SEE DETAIL G-8.
4. THE COVER FOR PIPING 12" OR LESS SHALL BE 30" MIN./36" MAX. IN UNPAVED AREAS AND 36" MIN./42"MAX. IN PAVED AREAS, UNLESS PRE-APPROVED BY SJCUD. THE COVER FOR PIPING 16" OR LARGER SHALL BE 42" MIN./54" MAX. IN UNPAVED AND PAVED AREAS, UNLESS PRE-APPROVED BY SJCUD. SEE SECTION 2.2.10 OF STANDARDS MANUAL.
5. SJCUD ONLY ALLOWS 50% OF THE PIPE MANUFACTURER'S RECOMMENDATION FOR JOINT DEFLECTION. BENDING THE PIPE BARREL IS NOT ALLOWED, THE MAXIMUM ARE LISTED IN TABLE BELOW. ONLY MANUAL FORCE CAN BE UTILIZED TO OBTAIN THESE JOINT DEFLECTIONS. ALL OFFSETS ARE BASED ON MINIMUM 20LF OF PIPE LENGTH.

PVC PIPE SIZE	MAX OFFSET (20LF JOINT)
4"	19"
6"	13"
8"	10"
10"	8"
12"	7"
16" & LARGER	5"

E TYPE "B" PIPE CROSSING WITH FITTINGS
- NTS
SJCUD 2026
PLATE G-13

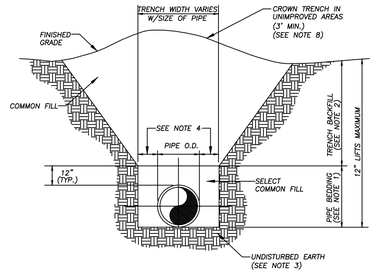


NOTES:
1. OPEN ROAD CUTS ARE GENERALLY NOT AN ACCEPTABLE MEANS OF CONSTRUCTION UNLESS APPROVED IN ADVANCE BY THE ENGINEERING RIGHT OF WAY DIVISION. SEE NOTE #3
2. MATERIALS, MIX PROPORTIONS, PRODUCTION, PLACING, CONSTRUCTION REQUIREMENTS, AND ACCEPTANCE OF FLOWABLE FILL SHALL BE IN ACCORDANCE WITH THIS MANUAL.
3. ALL OPEN CUTS SHALL REQUIRE A PERMIT AND 48 HOUR ADVANCE NOTICE TO THE INSPECTION STAFF PRIOR TO COMMENCEMENT OF CONSTRUCTION. A REPRESENTATIVE FROM THE ENGINEERING R.O.W. DIV. STAFF MUST BE PRESENT AT THE TIME OF INSTALLATION OF THE UTILITY.
4. PUBLIC SAFETY SHALL BE MAINTAINED DURING CONSTRUCTION IN ACCORDANCE WITH THE PROVISIONS OF PART 6, WORK ZONE TRAFFIC CONTROL, OF THE MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES.
5. THE CONTRACTOR SHALL PROVIDE TO THE INSPECTOR CERTIFICATION OF THE MIX DESIGN FROM THE SUPPLIER AT THE TIME OF CONSTRUCTION.
6. AN OVERLAY UP TO 100' IS REQUIRED ON ALL OPEN ROAD CUTS AND WILL BE DETERMINED AT TIME OF PERMIT APPLICATION REVIEW.

PIPE DIAMETER OR SPAN WIDTH	"X"
≤ 12"	12 INCHES
≤ 30"	24 INCHES
≤ 42"	30 INCHES
≤ 48"	36 INCHES
≤ 60"	42 INCHES
> 60"	48 INCHES

F TYPE "B" PIPE CROSSING WITH DEFLECTION
- NTS
SJCUD 2026
PLATE G-14

G OPEN ROAD TRENCH/PAVEMENT RESTORATION
- NTS
SJCUD 2026
PLATE D-201



NOTE:
1. PIPE BEDDING: SELECT COMMON FILL COMPACTED TO 95% OF THE MAXIMUM DENSITY AS PER AASHTO T-180.
2. TRENCH BACKFILL: COMMON FILL COMPACTED TO 95% OF THE MAXIMUM DENSITY AS PER AASHTO T-180.
3. PIPE BEDDING UTILIZING SELECT COMMON FILL OR BEDDING ROCK IN ACCORDANCE WITH TYPE A BEDDING AND TRENCHING DETAIL MAY BE REQUIRED AS DIRECTED BY THE INSPECTOR.
4. 12" MINIMUM, 15" MAXIMUM FOR PIPE DIAMETER LESS THAN 24", AND 24" MAXIMUM FOR PIPE DIAMETER 24" AND LARGER.
5. WATER SHALL NOT BE PERMITTED IN THE TRENCH DURING CONSTRUCTION.
6. ALL PIPE TO BE INSTALLED WITH BELL FACING UPSTREAM TO THE DIRECTION OF THE FLOW.
7. REFER TO SECTION 3.3 OF THE MANUAL FOR SHEETING AND BRACING IN EXCAVATIONS.
8. FINAL RESTORATION IN IMPROVED AREAS SHALL BE IN COMPLIANCE WITH ALL APPLICABLE REGULATIONS OF GOVERNING AGENCIES. SURFACE RESTORATION WITHIN COUNY RIGHT-OF-WAY SHALL COMPLY WITH REQUIREMENTS OF RIGHT-OF-WAY UTILIZATION REGULATIONS AND ROAD CONSTRUCTION SPECIFICATIONS.
9. ALL TRENCHING SHALL BE IN ACCORDANCE WITH FLORIDA TRENCH SAFETY ACT.

H UNPAVED TYPE B BEDDING AND TRENCHING
- NTS
SJCUD 2026
PLATE G-7

NO.	BY	DATE	SYMBOL	REVISIONS
6.				
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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	S. ALIX
DRAWN BY:	B. LEE
DATE:	JUNE 2026
CHECKED BY:	C. TUCKER
DATE:	JUNE 2026

DESIGN ENGINEER
CALE MADDEN, P.E.
FLORIDA REGISTRATION NO.
88379

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

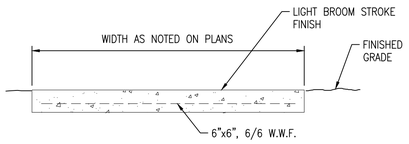
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

CIVIL DETAILS

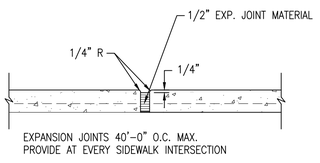
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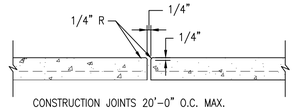
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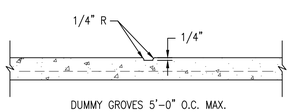
WALK SECTION



EXPANSION JOINT



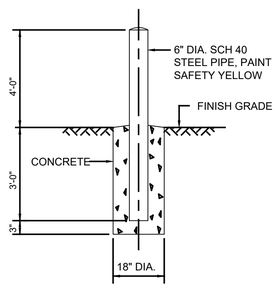
CONSTRUCTION JOINT



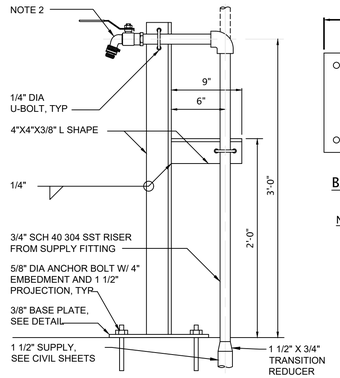
DUMMY GROOVE

NOTES:
1. WALK SLOPES VARY, SEE PLAN.
2. CONCRETE IS 2,500 PSI MEETING REQUIREMENTS OF FDOT STANDARD SPECIFICATIONS FOR ROAD & BRIDGE CONSTRUCTION SECTION 522 LATEST EDTION.

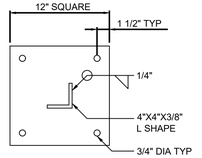
A - SIDEWALK DETAILS
NTS



B - PIPE BOLLARD
NTS

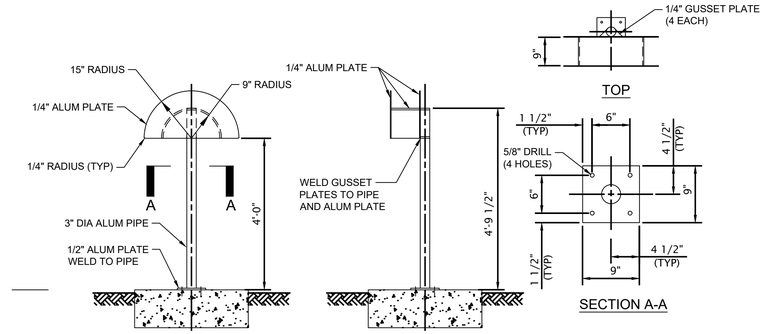


C - FREE-STANDING HOSE BIBB
NTS

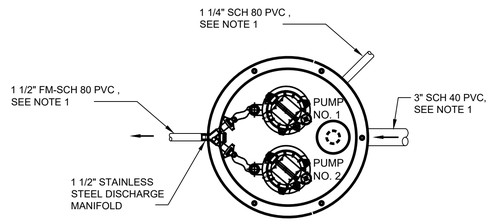


BASE PLATE DETAIL

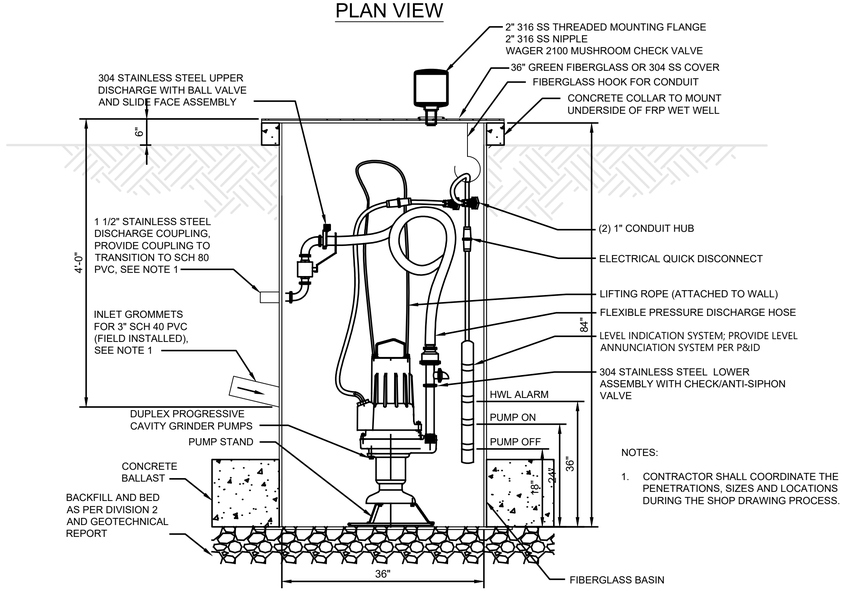
NOTES:
1. ALL ANCHORS SHALL BE 316 SST.
2. 3/4" SST BALL VALVE HOSE BIBB W/LEVER HANDLE. ANTI-SIPHON VACUUM BREAKER.
3. AS PER DEP RULE 62-610.469, RECLAIMED WATER HOSE BIBBS SHALL BE LABELED AS NON-POTABLE WATER WITH SIGNS STATING "DO NOT DRINK" IN ENGLISH AND SPANISH. CONTRACTOR SHALL PROVIDE SIGNS FOR ALL RECLAIMED WATER HOSE BIBBS.



D - YARD HOSE BIBB RACK
NTS

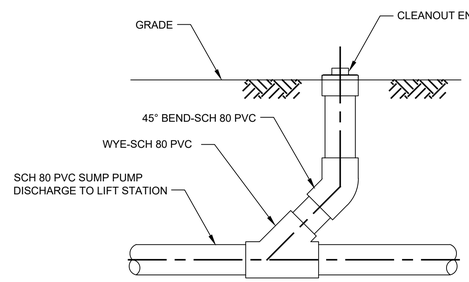


PLAN VIEW

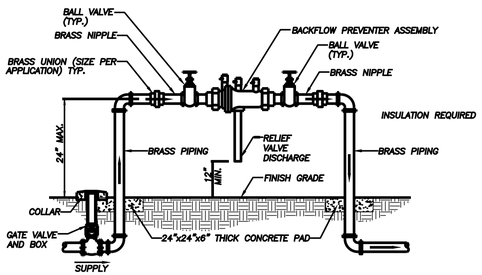


NOTES:
1. CONTRACTOR SHALL COORDINATE THE PENETRATIONS, SIZES AND LOCATIONS DURING THE SHOP DRAWING PROCESS.

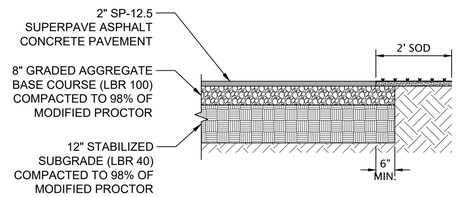
F - DUPLEX GRINDER PUMP STATION
NTS



G - CLEANOUT
NTS



REDUCED PRESSURE BACKFLOW PREVENTER 2" DIAMETER AND SMALLER
NTS
SJCUD 2026
PLATE: W-6



E - ASPHALT PAVEMENT
NTS

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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	S. ALIX
DRAWN BY:	B. LEE
DATE:	JUNE 2026
CHECKED BY:	C. TUCKER
DATE:	JUNE 2026

DESIGN ENGINEER
CALE MADDEN, P.E.
FLORIDA REGISTRATION NO.
88379

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

CIVIL DETAILS

SHEET NO. 11
DWG NO. CD-3
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Xrefs Attached= SJCUD_22X34_BOR_FW [..\Xrefs\SJCUD_22X34_BOR.dwg]
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BUILDING CODE SUMMARY

GENERAL INFORMATION
Name of Project: SJCUD NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS
Address: 415 Nineteenth Street,
St. Augustine FL 32084

Proposed Use: F2
Owner or Authorized Agent: SJCUD

CODES REVIEWED:

2020 FLORIDA BUILDING CODE, 7th EDITION. BUILDING (FBC-B)
2020 FLORIDA BUILDING CODE, 7th EDITION. MECHANICAL (FBC-M)
2020 FLORIDA BUILDING CODE, 7th EDITION. PLUMBING (FBC-P)
2020 FLORIDA FIRE PREVENTION CODE, 7th EDITION. (FFPC)
NFPA 70 - 2017 NATIONAL ELECTRICAL CODE

RE-PUMP AND ELECTRICAL BUILDING

BUILDING CLASSIFICATION OCCUPANCY - SECTION 306.4 CONSTRUCTION - SECTION 602.2	GROUP F-2 SPECIAL PURPOSE FACTORY INDUSTRIAL TYPE II B (UNSPRINKLERED)		
BUILDING HEIGHTS AND AREAS TABLE 503	MAX. AREA 23,000 SF MAX. HEIGHT 55 FEET MAX. STORIES 3	ACTUAL 2,250 SF ACTUAL 20 FEET ACTUAL 1	
OCCUPANT LOAD TABLE 1004.1 EXCEPTION 1	5 EMPLOYEES MAXIMUM FOR MAINTENANCE (BUILDING IS OCCUPIED FOR PERIODIC MAINTENANCE ONLY AND IS OTHERWISE "UNOCCUPIED").		
EXITS PER SPACE SECTION 1015	REQUIRED 1 TOTAL THIS BUILDING	ACTUAL 3 3	
MAX. TRAVEL DISTANCE TABLE 1016.1	MAXIMUM 200 FEET	ACTUAL 49 FEET	
FIRE SEPARATION DISTANCE	TYPE II B > 30 FEET FROM OTHER BLDG. AND PROPERTY LINE = 0 HR.		
FIRE RESISTANCE RATING TABLE 602	0 HR. RATING FOR EXTERIOR WALLS		
STAIRS	N/A		
RAMPS	N/A		
HAZARDOUS CHEMICALS INTERIOR STORAGE	N/A		
EXTERIOR STORAGE	N/A		
SPRINKLERS REQUIRED	NO		

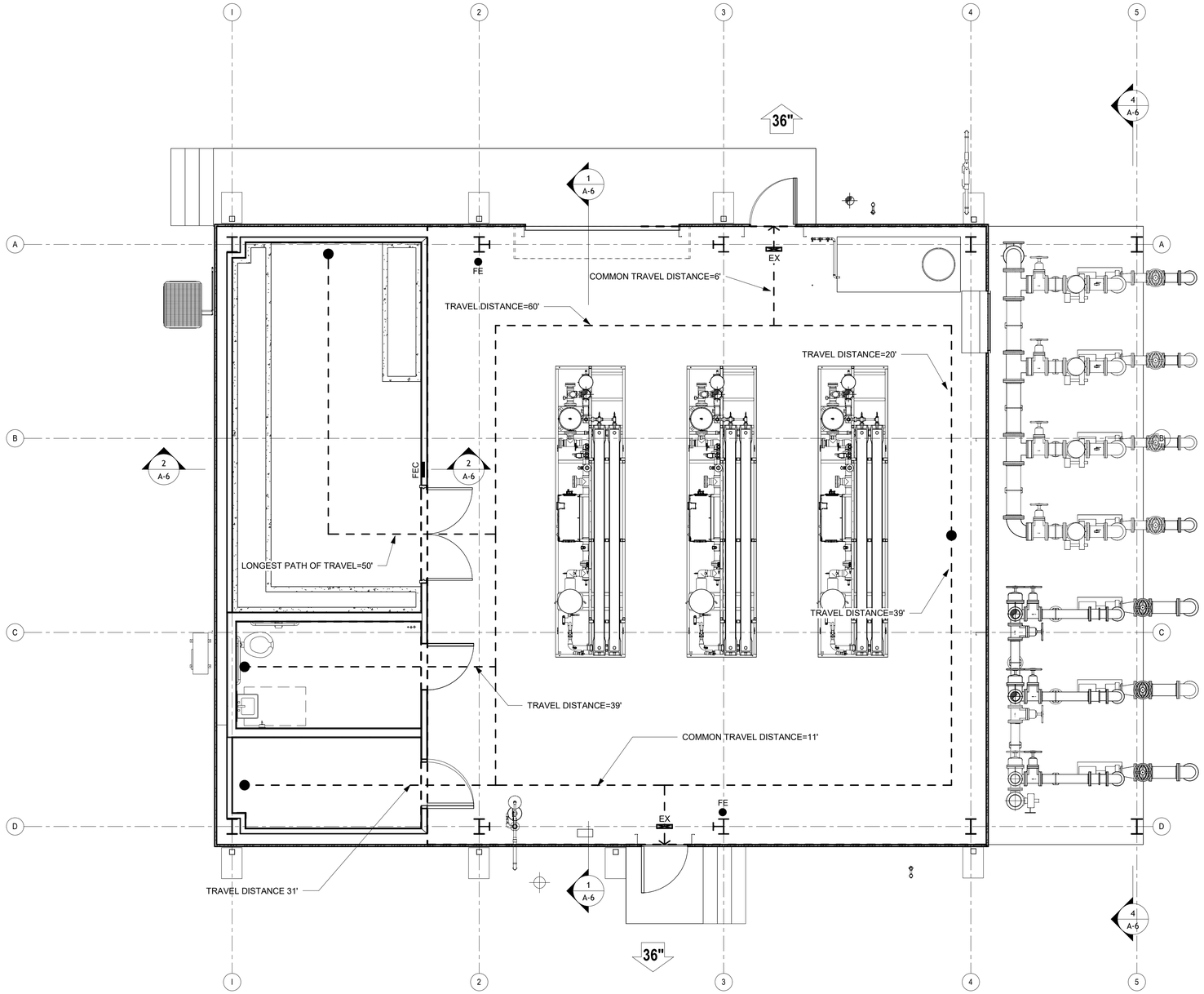
34" EXIT-WITH CLEAR EGRESS WIDTH

TRAVEL DISTANCE TO AN EXIT

FE FIRE EXTINGUISHER

FEC FIRE EXTINGUISHER CABINET

EX EXIT LIGHT



3 WTP PUMP BUILDING LIFE SAFETY PLAN
1/4" = 1'-0"

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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	SA
DRAWN BY:	AD
DATE:	JUNE 2026
CHECKED BY:	CM
DATE:	JUNE 2026

DESIGN ENGINEER
CALE MADDEN

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St. Johns County Utility Department
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NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

BUILDING CODE SUMMARY

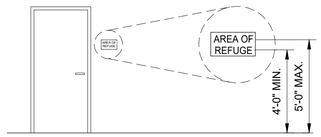
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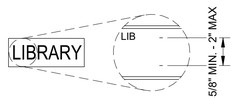
ABBREVIATIONS

THIS LIST IS NOT ALL INCLUSVE

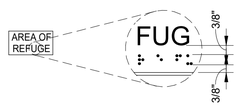
A.F.F.	ABOVE FINISHED FLOOR
A.C.T.	ACOUSTICAL TILE
ADJ	ADJACENT
ADJT	ADJUSTABLE
ALT	ALTERNATE
ALUM	ALUMINUM
ANOD	ANODIZED
BRG	BEARING
B.M.	BENCH MARK
BLKG	BLOCKING
BD	BOARD
BTM	BOTTOM
CIP	CAST IN PLACE
CLG	CEILING
CLOS	CLOSET
CO	CLEAN OUT
CLR	CLEAR
COL	COLUMN
CONC	CONCRETE
CMU	CONCRETE MASONRY UNIT
CONT	CONTINUOUS
CJ	CONTROL JOINT
CG	CORNER GUARD
CFCI	CONTRACTOR FURNISHED CONTRACTOR INSTALLED
DTL	DETAIL
DIAG	DIAGONAL
DIA	DIAMETER
DIM	DIMENSION
D.S.	DOWNSPOUT
D	DRAIN
D.F.	DRINKING FOUNTAIN
EP	ELECTRICAL PANELBOARD
EWC	ELECTRIC WATER COOLER
EL	ELEVATION
EQ	EQUAL
EF	EXHAUST FAN
EXIST	EXISTING
E.J.	EXPANSION JOINT
F.V.	FIELD VERIFY
F.O.C.	FACE OF CONCRETE
F.O.F.	FACE OF FINISH
F.O.M.	FACE OF MASONRY
F.O.S.	FACE OF STUD
F.O.W.	FACE OF WALL
FIN	FINISH
FIN. FLR.	FINISH FLOOR
F.E.C.	FIRE EXTINGUISHER CABINET
FA	FIRE ALARM
FH	FIRE HYDRANT
FL	FLOOR
FTG	FOOTING
FDN	FOUNDATION
FD	FLOOR DRAIN
GA	GAUGE
GALV	GALVANIZED
GWB	GYPSUM WALLBOARD
GYP	GYPSUM
HC	HANDICAP
HDW	HARDWARE
HVAC	HEATING / VENTILATION / AC
HM	HOLLOW METAL
HORIZ	HORIZONTAL
HB	HOSE BIBB
HR	HOUR
INSUL	INSULATION
IN	INCH
INT	INTERIOR
MFR	MANUFACTURER
M.O.	MASONRY OPENING
MAT	MATERIAL
MAX	MAXIMUM
MECH	MECHANICAL
MTL	METAL
MIN	MINIMUM
MISC	MISCELLANEOUS
MTD	MOUNTED
MUL	MULLION
NOM	NOMINAL
N	NORTH
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
NO	NUMBER
O.C.	ON CENTER
OPNG	OPENING
OD	OUTSIDE DIAMETER
OPP.	HAND OPPOSITE HAND
O.H.	OVER HEAD
OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
OFOI	OWNER FURNISHED OWNER INSTALLED
P. LAM	PLASTIC LAMINATE
PART.	PARTITION
PC	PRECAST CONCRETE
PL	PLATE
PLYWD	PLYWOOD
PIP	POURED IN PLACE
PREFAB	PREFABRICATED
PTC	POST TENSIONED CONCRETE
P.T.	PRESSURE TREATED
PVC	POLYVINYL CHLORIDE
RAD.	RADIUS
REQ.	REQUIRED
R.D.	ROOF DRAIN
R.O.	ROUGH OPENING
R.O.W.	RIGHT OF WAY
RM	ROOM
REF	REFERENCE
REV.	REVISION
SCHED	SCHEDULE
SECT	SECTION
SHT	SHEET
SIM	SIMILAR
SK	SKYLIGHT
SPKR	SPEAKER
SPEC	SPECIFICATIONS
S.S.	STAINLESS STEEL
STD	STANDARD
STA	STATION
STL	STEEL
STOR	STORAGE
STRUCT	STRUCTURAL
SUSP CL	SUSPENDED CEILING
S.F.	SQUARE FEET
TEL	TELEPHONE
THK	THICK
T&G	TONGUE AND GROOVE
T/B	TOP AND BOTTOM
T.O.C.	TOP OF CONCRETE
T.O.M.	TOP OF MASONRY
T.O.S.	TOP OF STEEL
T.O.W.	TOP OF WALL
TYP	TYPICAL
U.N.O.	UNLESS OTHERWISE NOTED
UL	UNDERWRITERS LABORATORIES
VB	VAPOR BARRIER
VCT	VINYL COMPOSITION TILE
VERT	VERTICAL
VTR	VENT THROUGH ROOF
WH	WALL HYDRANT
WC	WATER CLOSET
WP	WATERPROOFING
WT	WEIGHT
WWF	WELDED WIRE FABRIC
WIN	WINDOW
W/	WITH
W/O	WITHOUT
WD	WOOD



NOTE:
TACTILE CHARACTERS ON SIGNS SHALL BE LOCATED 48 INCHES MINIMUM ABOVE THE FLOOR OR GROUND SURFACE MEASURED FROM THE BASELINE OF THE LOWEST TACTILE CHARACTER AND 60 INCHES MAXIMUM ABOVE THE FLOOR OR GROUND SURFACE MEASURED FROM THE BASELINE OF THE HIGHEST TACTILE CHARACTER



NOTE:
CHARACTER HEIGHT MEASURED VERTICALLY FROM THE BASELINE OF THE CHARACTER SHALL BE 5/8 INCH MINIMUM AND 2 INCHES MAXIMUM BASED ON THE HEIGHT OF THE UPPERCASE LETTER"I"



NOTE:
BRAILLED SHALL BE POSITIONED BELOW THE CORRESPONDING TEXT.
IF TEXT IS MULTILINED, BRAILLED SHALL BE PLACED BELOW THE ENTIRE TEXT.
BRAILLE SHALL BE SEPARATED 3/8" MINIMUM FROM ANY OTHER TACTILE CHARACTERS AND 3/8" MINIMUM FROM RAISED BORDERS AND DECORATIVE ELEMENTS.

MATERIALS LEGEND

SELECT COMPACT FILL

POROUS / STONE / ROCK FILL

CONCRETE

PLASTER, GROUT, STUCCO FINISH

MASONRY VENEER, GENERAL HATCHING

CONCRETE BLOCK

PLYWOOD SHEATHING

ROUGH WOOD

FINISH WOOD

INSULATION

METAL

RIGID INSULATION

SYMBOLS LEGEND

NORTH ARROWS

EXTERIOR ELEVATION — SHEET NO. / DETAIL NO. — X / X

INTERIOR ELEVATION — SHEET NO. — DETAIL NO. TYP. — X / X

SECTION — DETAIL NO. TYP. / SHEET NO. — ? / ? / ?

DOOR SYMBOL — ?

WINDOW / LOUVER SYMBOL — 2

ROOM TAG — ROOM / 123

KEYNOTE TAG — 01 01 01.1

SPOT ELEVATION

DETAIL CALLOUT / ENLARGED PLAN — DETAIL NO. TYP. / SHEET NO. — ? / ? / ?

COLUMN CENTERLINE — ?

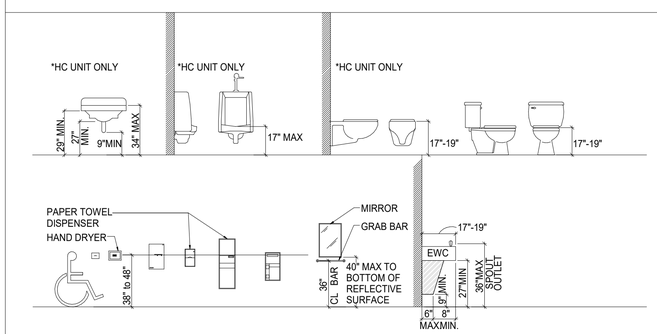
WALL TYPE — ?

REVISION / ADDENDA TAG — 2

GENERAL NOTES

1. ALL WORK MATERIALS AND WORKMANSHIP SHALL BE PERFORMED IN STRICT ACCORDANCE WITH, AND SHALL CONFORM WITH, ALL FEDERAL, STATE AND LOCAL CODE ORDINANCES, RULES AND REGULATIONS, TO THE PUBLISHED SPECIFICATIONS AND RECOMMENDED PRACTICES OF THE MANUFACTURERS AND THE APPROPRIATE APPLICABLE STANDARDS, WHERE SUCH CODES, RULES AND REGULATIONS ARE AT VARIANCE WITH THE PLANS AND NOTES, SAID CODES, RULES AND REGULATIONS, ETC. SHALL TAKE PRECEDENCE OVER THE PLANS AND NOTES.
2. THE CONTRACTOR IS RESPONSIBLE FOR COMPLIANCE WITH ALL APPLICABLE BUILDING CODES AND REGULATIONS NECESSARY TO PERFORM ALL WORK AND SERVICES HEREIN NOTED OR INDICATED ON THE DRAWINGS
3. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS AND EXISTING CONDITIONS AT THE JOB SITE AND SHALL REPORT ANY DISCREPANCIES TO THE ARCHITECT / ENGINEER / OWNER PRIOR TO STARTING CONSTRUCTION. COMMENCEMENT OF THE WORK BY THE CONTRACTOR SHALL IMPLY HIS ACCEPTANCE OF ALL EXISTING CONDITIONS.
4. ALL WORK SHALL BE EXECUTED IN A CAREFUL AND ORDERLY MANNER WITH THE LEAST POSSIBLE NOISE, DUST, OR DISTURBANCE TO OCCUPANTS, ADJACENT SITES OR BUILDINGS. ALL INGRESS/EGRESS ROUTES AND PARKING AREAS TO BE SWEPT CLEAN AND FREE OF DEBRIS AT ALL TIMES.
5. THE CONTRACTOR SHALL PROVIDE PROTECTION FOR THE GENERAL PUBLIC AND CONSTRUCTION WORKERS IN AND AROUND THE CONSTRUCTION SITE. ADEQUATE BARRIERS SHALL BE PROVIDED TO EXERCISE CONTROL OF SAFE INGRESS AND EGRESS OF PREMISES. FIRE EXITS SHALL AT NO TIME BE BLOCKED.
6. DETAILS ON THE DRAWINGS ARE SHOWN AT SPECIFIC LOCATIONS AND ARE INTENDED TO SHOW GENERAL REQUIREMENTS THROUGHOUT. DETAILS NOTED "TYP." IMPLY ALL CONDITIONS TREATED SIMILARLY.
7. MINOR DETAILS NOT USUALLY SHOWN OR SPECIFIED BUT NECESSARY FOR PROPER CONSTRUCTION OF ANY PART OF THE WORK SHALL BE INCLUDED AS IF THEY WERE INDICATED ON THE DRAWINGS.
8. THE CONTRACTOR SHALL FULLY FAMILIARIZE HIMSELF OF THE CONDITIONS RELATING TO THE CONSTRUCTION AND LABOR UNDER WHICH THE WORK WILL BE PERFORMED AND COMPARE THE DRAWINGS AND SPECIFICATIONS WITH THE WORK IN PLACE. FAILURE TO DO SO WILL NOT RELIEVE CONTRACTOR OF HIS OBLIGATION TO FURNISH ALL LABOR AND MATERIAL NECESSARY TO CARRY OUT THE PROVISIONS OF THE CONTRACT DOCUMENTS AND TO COMPLETE THE CONTEMPLATED WORK FOR THE CONSIDERATION SET FORTH IN HIS BID. EACH CONTRACTOR, IN THE CARRYING OUT OF HIS WORK, SHALL EMPLOY SUCH CONSTRUCTION METHODS OR MEANS THAT WILL NOT CAUSE ANY INTERRUPTIONS OR INTERFERENCE WITHIN THE WORK OF ANY OTHER TRADES.
9. SHOULD DISCREPANCIES OCCUR BETWEEN CONTRACT DRAWINGS AND SPECIFICATIONS, THE SPECIFICATIONS IN CONJUNCTION WITH ALL APPLICABLE CODES, STANDARDS, RULES, REGULATIONS, LAWS, ETC. SHALL TAKE PRECEDENCE OVER CONTRACT DRAWINGS.
10. UNLESS STATED OTHERWISE, ALL WORK INCLUDED IN CONTRACT DRAWINGS & SPECIFICATIONS ARE "NEW WORK" AND TO BE PERFORMED BY THE CONTRACTOR PER TERMS OF CONTRACT.
11. REFER TO CIVIL, STRUCTURAL, MECHANICAL, ELECTRICAL, PLUMBING, ETC. (CONSULTANT) DRAWINGS FOR ADDITIONAL DEMOLITION WORK REQUIRED TO ACCOMMODATE NEW CONSTRUCTION WORK. CONFIRM TERMINATION AND/OR REMOVAL OF EXISTING FIXTURES, DEVICES AND SERVICES, ETC. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO COORDINATE WITH THE ARCHITECTURAL DRAWINGS BEFORE THE INSTALLATION OF ANY OF THE CONSULTANT'S WORK AND BRING ANY DISCREPANCIES OR CONFLICTS TO THE ARCHITECT'S ATTENTION, IN WRITING, FOR CLARIFICATION. IMPROPERLY INSTALLED WORK SHALL BE CORRECTED BY THE GENERAL CONTRACTOR AT HIS EXPENSE AND AT NO EXPENSE TO THE ARCHITECT, HIS CONSULTANTS, OR THE OWNER.
12. SIZE OF MECHANICAL AND ELECTRICAL EQUIPMENT PADS AND BASES ARE APPROXIMATE ONLY. THE CONTRACTOR SHALL VERIFY DIMENSIONS WITH RESPECTIVE EQUIPMENT MANUFACTURERS.
13. CONTRACTOR SHALL PROVIDE AND INSTALL ALL BLOCKING, STIFFENERS, BRACING, BACK-UP PLATES AND SUPPORTING BRACKETS REQUIRED FOR THE INSTALLATION OF ALL CASEWORK, TOILET ACCESSORIES AND OF ALL FLOOR MOUNTED, WALL MOUNTED OR SUSPENDED MECHANICAL AND ELECTRICAL EQUIPMENT AND DEVICES.
14. ALL PIPES, DUCTS, BUSE DUCTS, ETC. WHICH PENETRATE THE FLOOR CONSTRUCTION SHALL BE INSTALLED SO AS TO MAINTAIN THE FIRE RESISTANCE RATING AND STRUCTURAL INTEGRITY OF THE BUILDING.
15. ALL PENETRATIONS THROUGH FIRE/SMOKE RATED WALLS, BARRIERS AND CEILINGS SHALL BE INSTALLED WITH FIRE/SMOKE DAMPERS, FIRE SEAL, CAULKING, ETC., SO AS FAR TO MAINTAIN THE FIRE & SMOKE RESISTANCE RATING AND STRUCTURAL INTEGRITY OF WALL OR CEILING ASSEMBLY.
16. ELECTRICAL PANELS, FIRE HOSE & EXTINGUISHER CABINETS AND RECESSED OBJECTS/DEVICES OVER 16 SQUARE INCHES LOCATED IN FIRE AND/OR SMOKE PARTITIONS/BARRIERS ARE TO BE WRAPPED IN GYPSUM BOARD OR OTHER FIRESTOPPING MATERIAL TO MAINTAIN THE FIRE-RESISTIVE RATING AS REQUIRED BY APPROVED U.L. ASSEMBLIES.
17. THESE DRAWINGS DO NOT INCLUDE THE MEANS AND METHODS NECESSARY FOR CONSTRUCTION INSTALLATIONS AND SAFETY. SAFETY OF ALL PARTIES PRESENT ON THE JOB SITE SHALL BE THE CONTRACTORS RESPONSIBILITY FROM START OF CONSTRUCTION THROUGH THE COMPLETION OF THE CONTRACT.
18. LEGAL EXITS AND EGRESS PATHS SHALL NOT BE BLOCKED AT ANYTIME.
19. DO NOT SCALE DRAWINGS. IF DIMENSIONS ARE IN QUESTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING CLARIFICATION FROM THE ARCHITECT/ENGINEER BEFORE PROCEEDING. ALL DIMENSIONS SHALL BE FIELD VERIFIED BY CONTRACTOR AND COORDINATED WITH ALL CONSULTANT DRAWINGS AND ALL OF THE WORK OF ALL TRADES.
20. ALL INDICATED DRAWING SCALES ARE ACCURATE ONLY WHEN THE DRAWINGS ARE PRINTED ON THE PROPER INTENDED SHEET SIZE FOR THE PROJECT. IF DRAWINGS ARE PRINTED AT A DIFFERENT SHEET SIZE, DRAWING SCALES MUST BE ADJUSTED ACCORDINGLY.

ADA NOTES



ADA DEFINITIONS

ANY SLOPE ALONG AN ACCESSIBLE ROUTE GREATER THAN 1:20 SHALL BE CONSIDERED A HANDICAPPED RAMP, AND SHALL BE
PROVIDED WITH THE REQUIRED DEVICES INCLUDING, BUT NOT LIMITED TO, RAILS AND CURBS.

ALL HANDICAPPED RAMPS SHALL SLOPE A MAXIMUM OF 1:12 AND CROSS SLOPES SHALL BE A MAXIMUM OF 1:50.

PRIOR TO INSTALLATION NOTIFY ARCHITECT OF ANY CONFLICTS BETWEEN THE REQUIRED MOUNTING HEIGHT AND OTHER EQUIPMENT
OR MATERIAL. IF NOTIFICATION IS NOT MADE AND INSTALLATION PROCEEDS, THE INSTALLER SHALL REMOVE, PATCH ADJACENT
FINISHES, AND REINSTALL OR REPLACE THE UNIT AT HIS COST WHERE DIRECTED BY THE ARCHITECT.

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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	SAA
DRAWN BY:	AD
DATE:	JUNE 2026
CHECKED BY:	CM
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DESIGN ENGINEER
CALE MADDEN
FLORIDA REGISTRATION NO.
88379

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

LEGENDS AND ABBREVIATIONS

SHEET NO. 13
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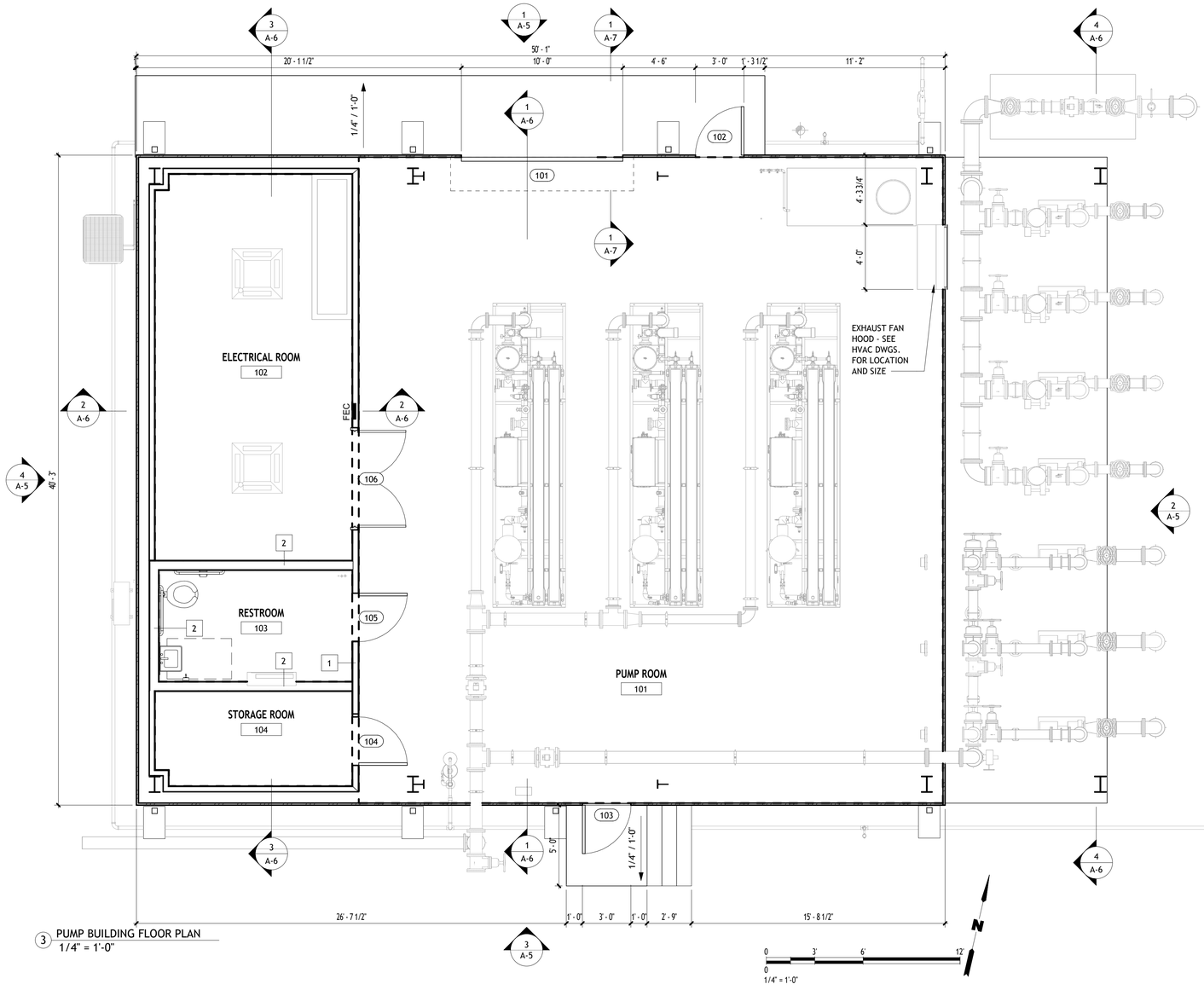
Door Schedule

Mark	Door: Size: Width	Height	Thickness	Material	Finish	Frame: Material	Type	Finish	Fire Rating	Hardware: Set	From Room: Number	Comments
101	10' - 0"	10' - 0"	0' - 2"	Metal-Protective	PTD	Metal-Protective	3	PTD				CHAIN OPENER
102	3' - 0"	7' - 0"	0' - 2"	FRP	PTD	FRP	1	FRP		LOCKSET W/PANIC HDW		
103	3' - 0"	7' - 0"	0' - 2"	FRP	PTD	FRP	1	FRP		LOCKSET W/PANIC HDW	101	
104	3' - 0"	7' - 0"	0' - 2"	Metal-Protective	PTD	Metal-Protective	1	PTD		LOCKSET W/PANIC HDW	104	
105	3' - 0"	7' - 0"	0' - 2"	Metal-Protective	PTD	Metal-Protective	1	PTD		LOCKSET W/PANIC HDW	103	3/4" UNDERCUT AT RESTROOM DOOR
106	6' - 0"	7' - 0"	0' - 1 3/4"	Metal-Protective	PTD	Metal-Protective	2	PTD	1-HR	LOCKSET W/PANIC HDW	102	

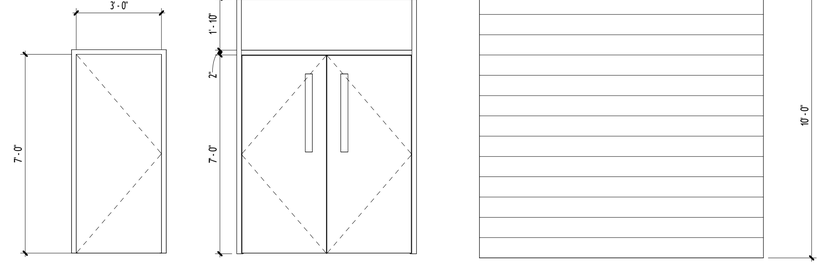
Room Finish Schedule

Room Number	Room Name	Floor Finish	Base Finish	Wall Finish	Ceiling Finish	Ceiling Height	Comments
101	PUMP ROOM	ACRYLIC COATED CONC.; SEE SPECS	6" RESILIENT BASE	VARIES	UNFINISHED		ELEC ROOM WALL, PEMB PANELS, OTHER WALLS - INSULATED
102	ELECTRICAL ROOM		6" RESILIENT BASE	FRP PANELS	ACT	10' - 0"	
103	RESTROOM	ACRYLIC COATED CONC.; SEE SPECS	6" RESILIENT BASE	PAINT	ACT	9' - 0"	
104	STORAGE ROOM	ACRYLIC COATED CONC.; SEE SPECS	6" RESILIENT BASE	PAINT	ACT	10' - 0"	

NOTE: DIMENSIONS ARE SHOWN FOR REPRESENTATIVE CONSTRUCTION PURPOSES. OVERALL THE FACILITY SHALL BE 40X50 OUT TO OUT. ADJUSTMENTS IN FRAMING AND INTERNAL DIMENSIONS SHALL BE COORDINATED AND APPROVED DURING THE CONSTRUCTION PROCESS. SIGNED AND SEALED PRE-ENGINEERED METAL BUILDING DRAWINGS WILL BE REQUIRED. ADJUSTMENTS IN INTERNAL DIMENSIONS AND FRAMING SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO ALLOW FOR VARYING GIRT REQUIREMENTS OF THE PEMB MANUFACTURER.



3 PUMP BUILDING FLOOR PLAN
1/4" = 1'-0"



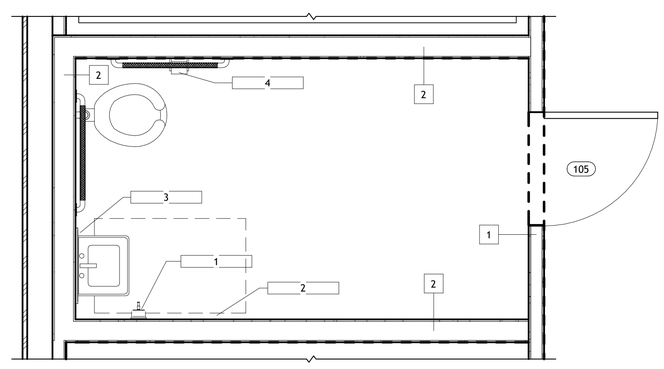
TYPE 1
INSULATED IMPACT DOOR AND FRAME

TYPE 2
HOLLOW METAL INSULATED DOUBLE DOOR AND FRAME W/ TRANSOM

TYPE 3
10' X 10' STEEL OVERHEAD ROLLING DOOR

TOILET ACCESSORIES SCHEDULE

MARK	DESCRIPTION	MODEL	REMARKS
1	SOAP DISPENSER	GOJO FMX-12 - BLACK - SKU5155-06	
2	HAND TOWEL DISPENSER	TORK ELEVATION MATIC MODEL 5510282	
3	MIRROR 24" X 36"	BRADLEY #740	MNT. BOT. @ 40" A.F.F.
4	TOILET PAPER DISPENSER	TORK TWIN JUMBO BATH TISSUE DISPENSER Article : 247549a color:black, SC10073286622393	



2 ENLARGED RESTROOM
1/2" = 1'-0"

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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	SA
DRAWN BY:	AD
DATE:	JUNE 2026
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DESIGN ENGINEER
CALE MADDEN

FLORIDA REGISTRATION NO.
88379

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

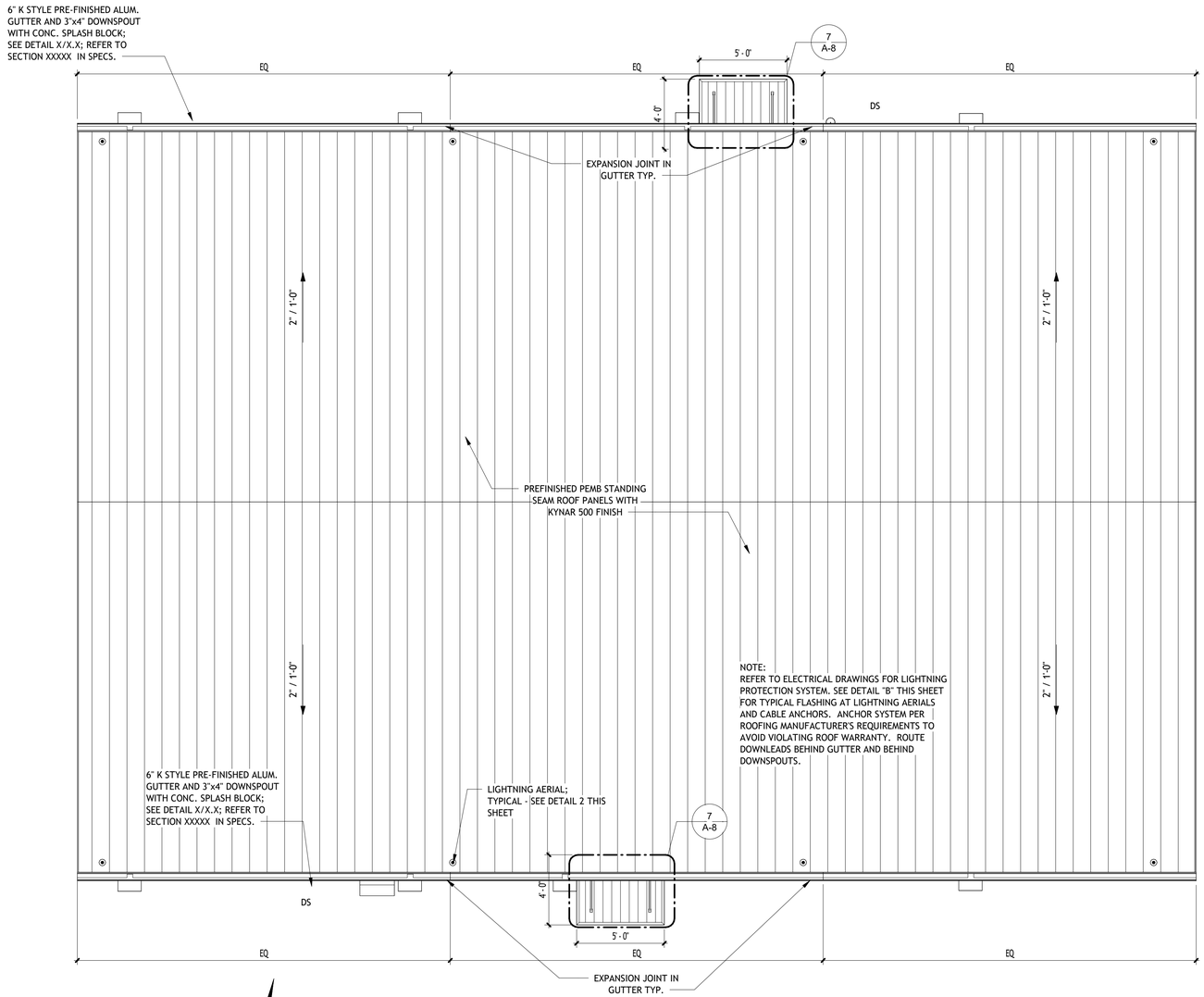
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

PUMP BUILDING FLOOR PLAN

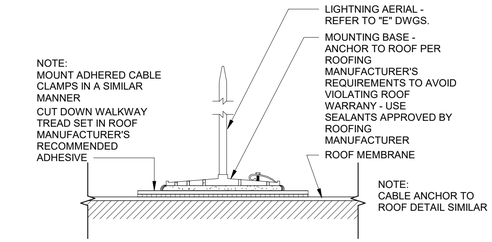
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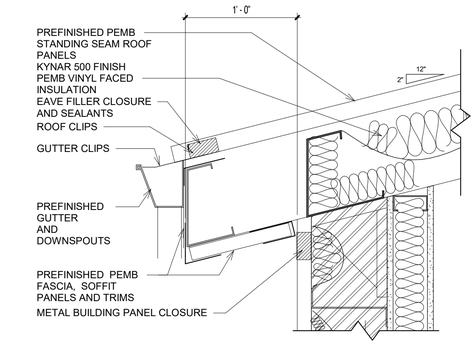
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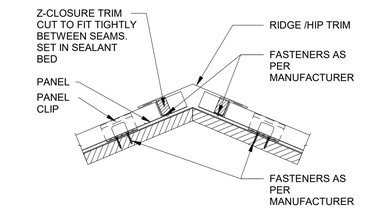
1 PUMP BUILDING ROOF PLAN
1/4" = 1'-0"



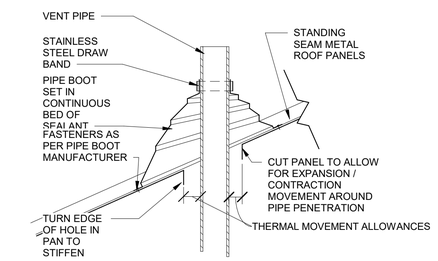
2 TYPICAL LIGHTNING AERIAL FLASHING
3" = 1'-0"



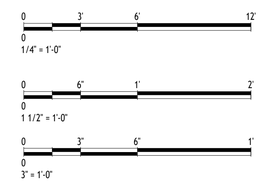
3 EAVE DETAIL
1 1/2" = 1'-0"



4 RIDGE DETAIL
1 1/2" = 1'-0"



5 VENT STACK DETAIL
1 1/2" = 1'-0"



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Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	SA	DESIGN ENGINEER
DRAWN BY:	AD	CALE MADDEN
DATE:	JUNE 2026	
CHECKED BY:	CM	FLORIDA REGISTRATION NO.
DATE:	JUNE 2026	88379

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

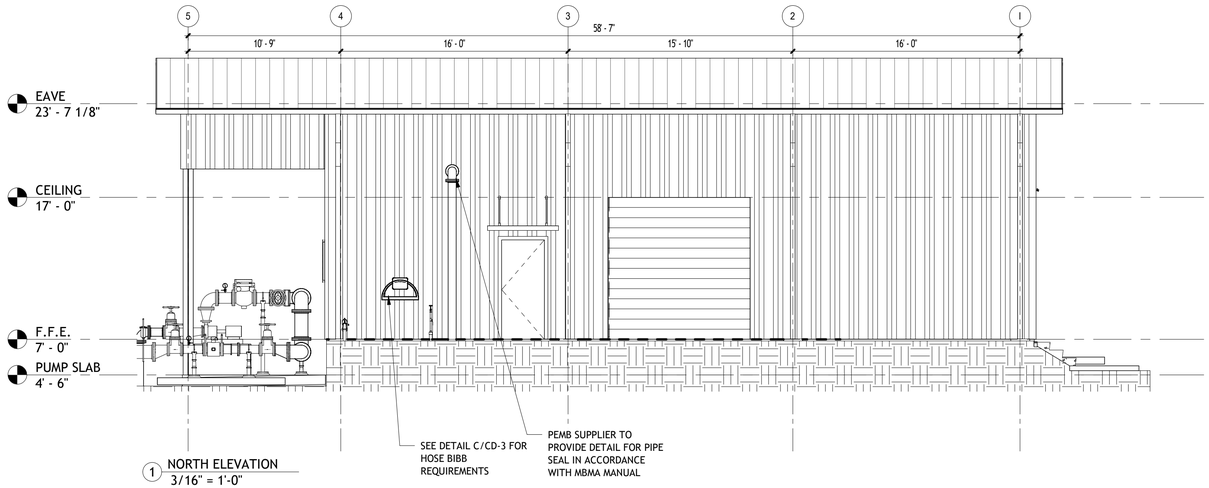
PUMP BUILDING ROOF PLAN

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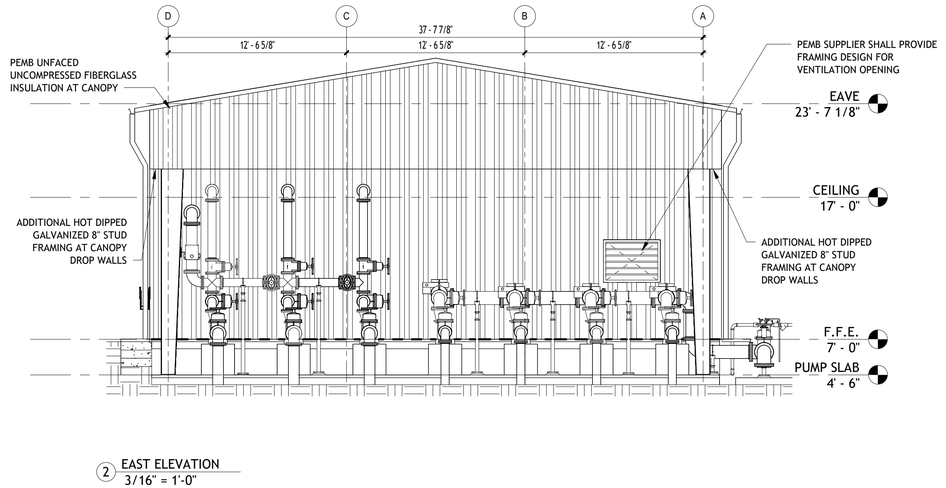
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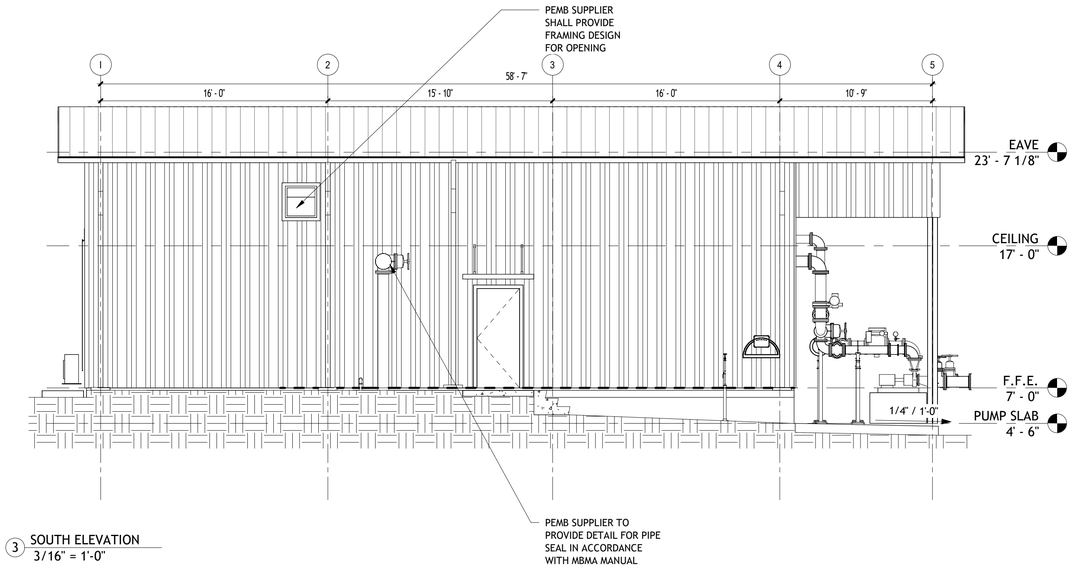
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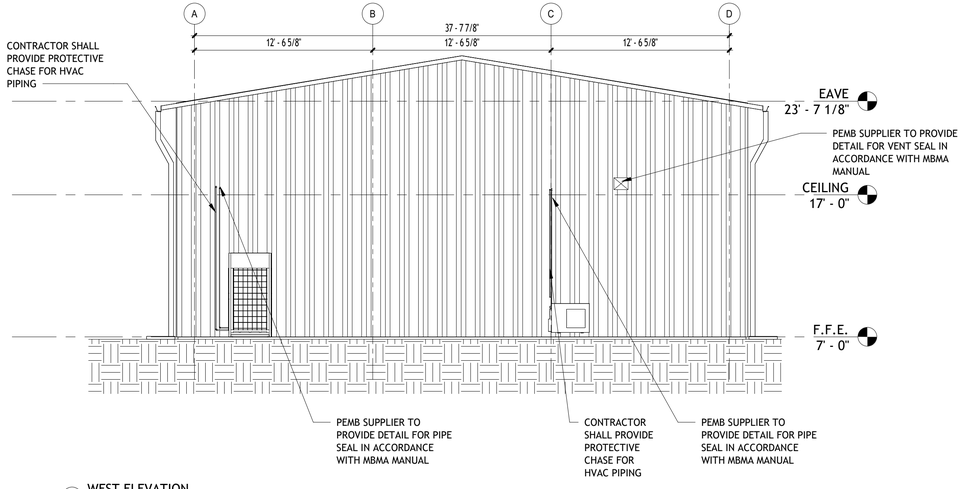
1 NORTH ELEVATION
3/16" = 1'-0"



2 EAST ELEVATION
3/16" = 1'-0"



3 SOUTH ELEVATION
3/16" = 1'-0"



4 WEST ELEVATION
3/16" = 1'-0"

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AA - C0000035 EB - 0000155 LB - 0006783
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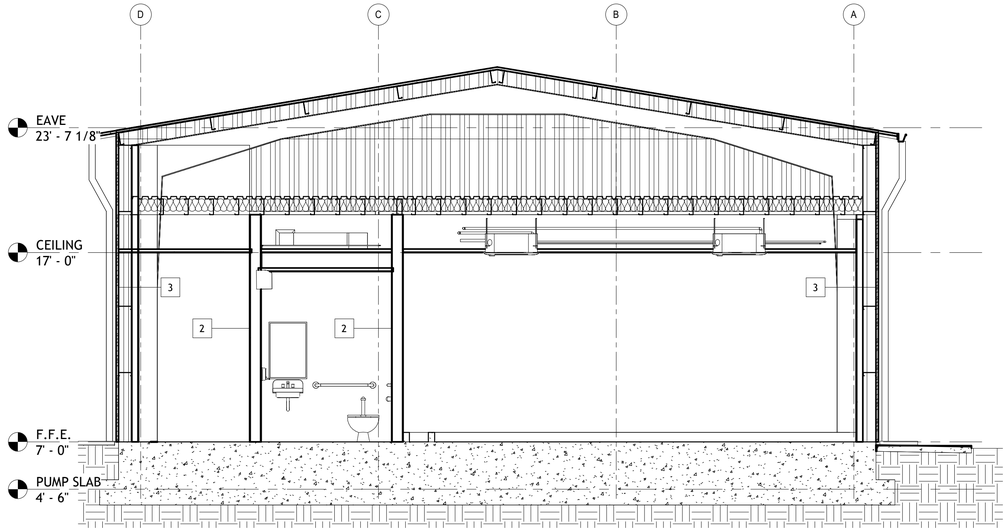
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

PUMP BUILDING ELEVATIONS

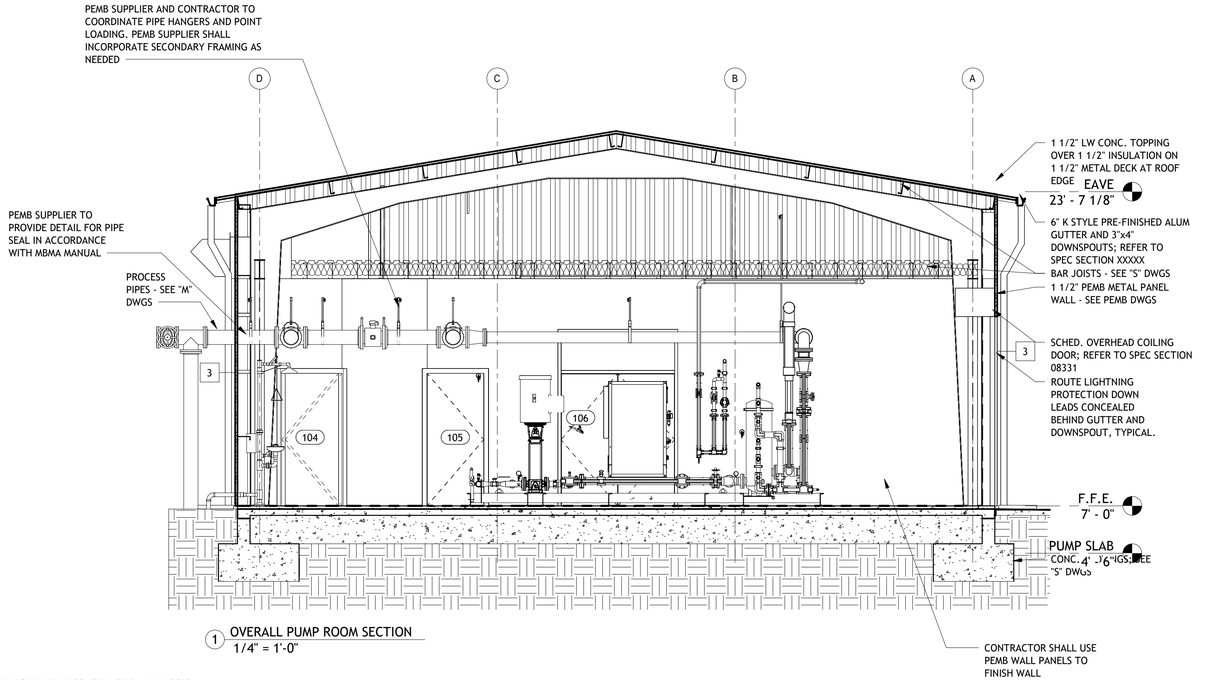
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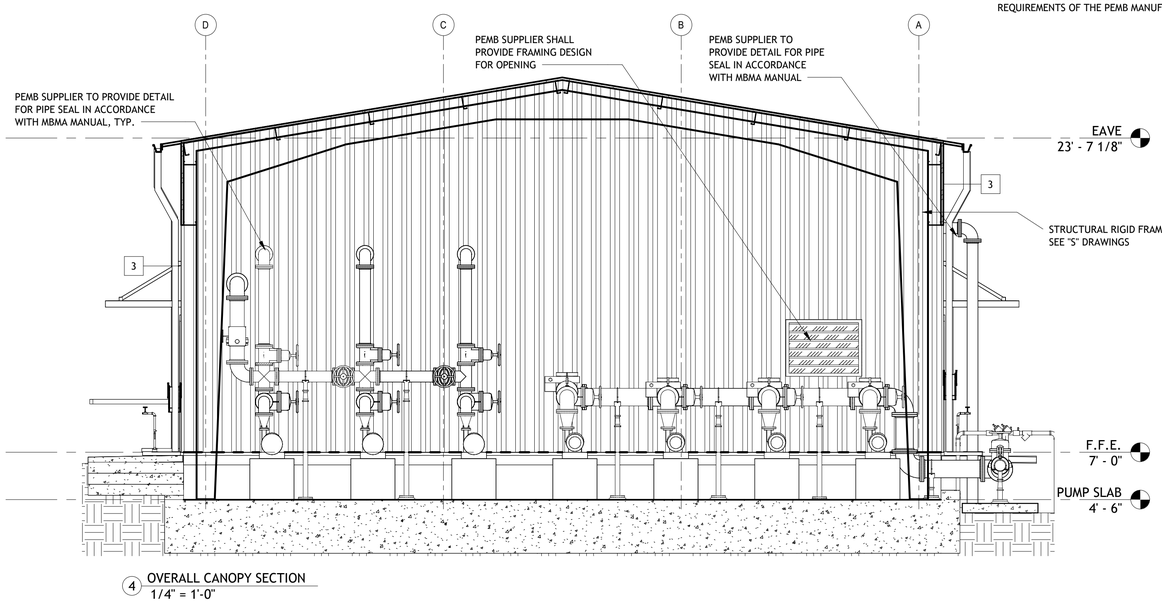


3 OVERALL SUPPORT ROOM SECTION
1/4" = 1'-0"

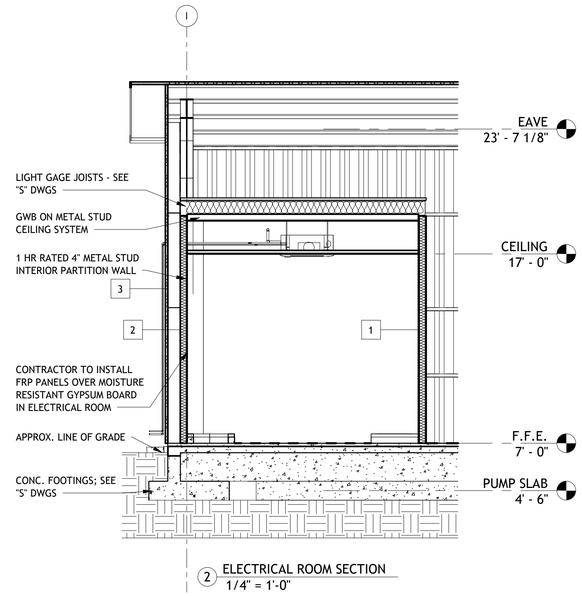


1 OVERALL PUMP ROOM SECTION
1/4" = 1'-0"

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4 OVERALL CANOPY SECTION
1/4" = 1'-0"



2 ELECTRICAL ROOM SECTION
1/4" = 1'-0"

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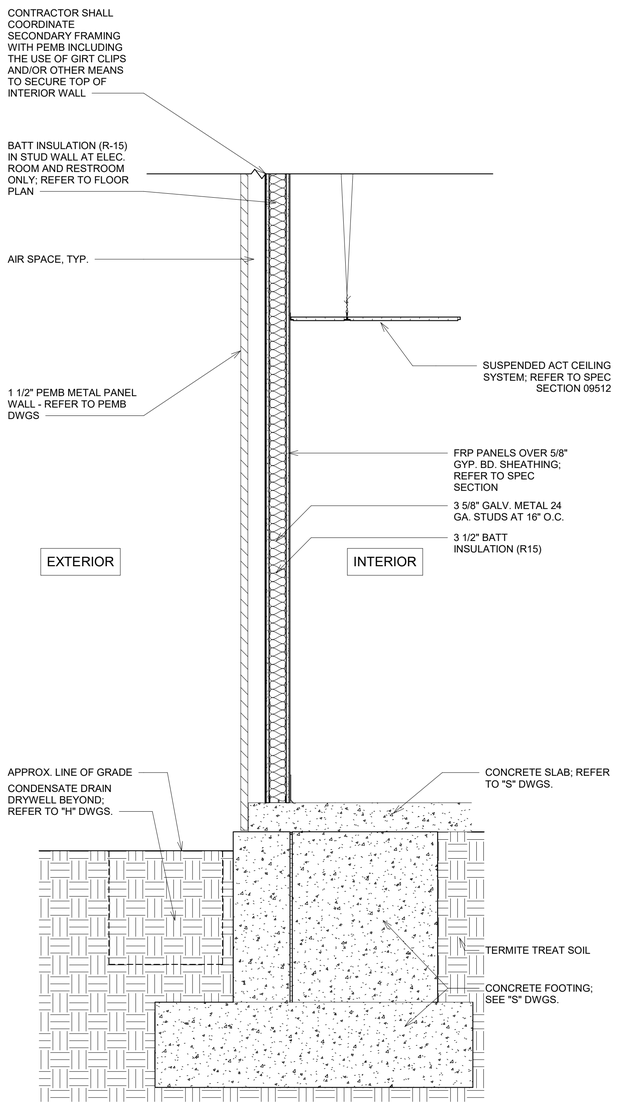
PUMP BUILDING SECTIONS

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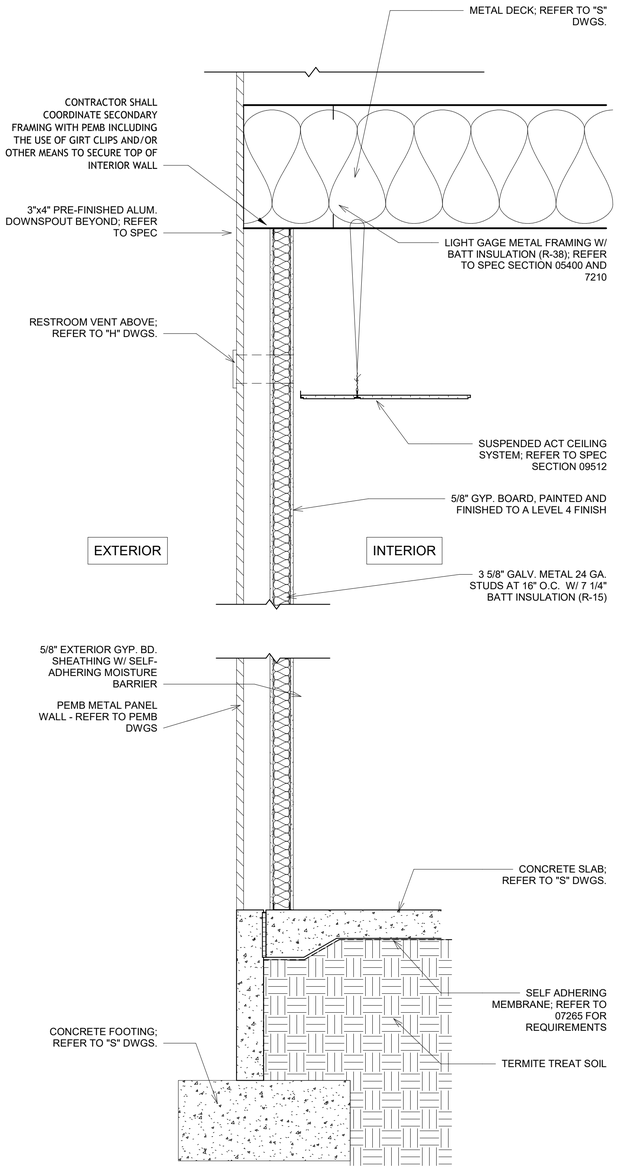
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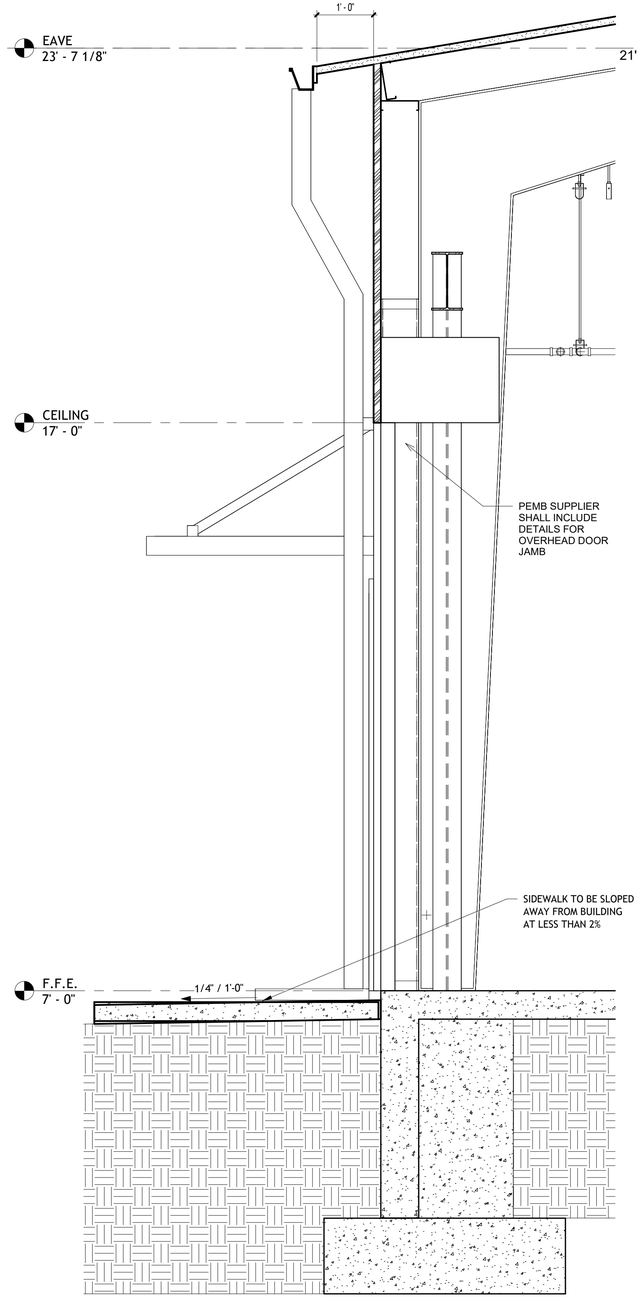
NOTE: DIMENSIONS ARE SHOWN FOR REPRESENTATIVE CONSTRUCTION PURPOSES. OVERALL THE FACILITY SHALL BE 40X50 OUT TO OUT. ADJUSTMENTS IN FRAMING AND INTERNAL DIMENSIONS SHALL BE COORDINATED AND APPROVED DURING THE CONSTRUCTION PROCESS. SIGNED AND SEALED PRE-ENGINEERED METAL BUILDING DRAWINGS WILL BE REQUIRED. ADJUSTMENTS IN INTERNAL DIMENSIONS AND FRAMING SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO ALLOW FOR VARYING GIRT REQUIREMENTS OF THE PEMB MANUFACTURER.



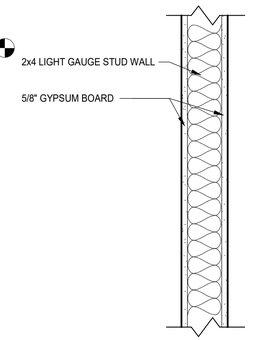
7 WALL SECTION AT ELEC. ROOM
3/4" = 1'-0"



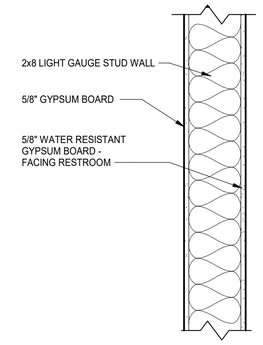
6 WALL SECTION AT RESTROOM
3/4" = 1'-0"



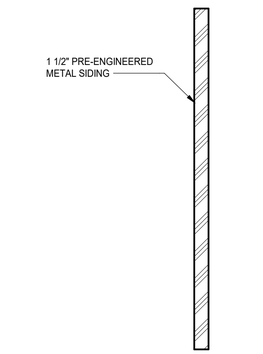
1 WALL SECTION AT OVERHEAD DOOR
3/4" = 1'-0"



WALL TYPE 1
1 1/2" = 1'-0"



WALL TYPE 2
1 1/2" = 1'-0"



WALL TYPE 3
1 1/2" = 1'-0"

NO.	BY	DATE	SYMBOL	REVISIONS
6.				
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1.				

MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	SA
DRAWN BY:	AD
DATE:	JUNE 2026
CHECKED BY:	CM
DATE:	JUNE 2026

DESIGN ENGINEER
CALE MADDEN
FLORIDA REGISTRATION NO.
88379

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

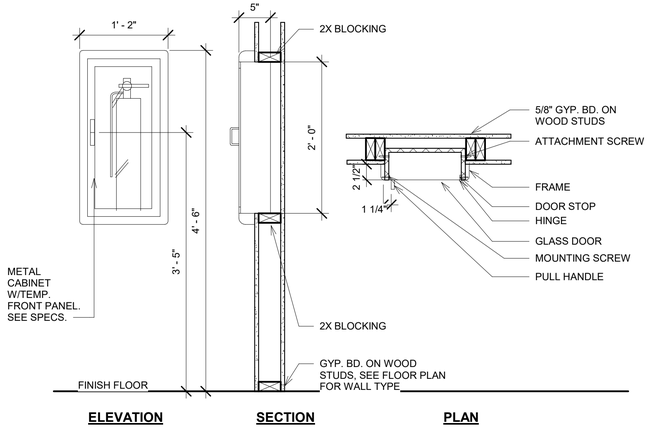
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

PUMP BUILDING WALL SECTIONS

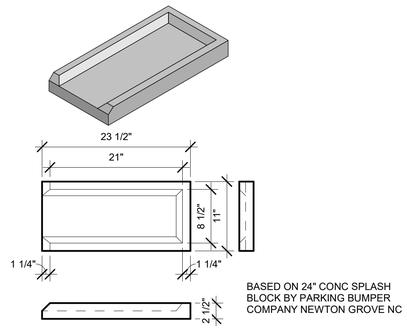
SHEET NO. 18
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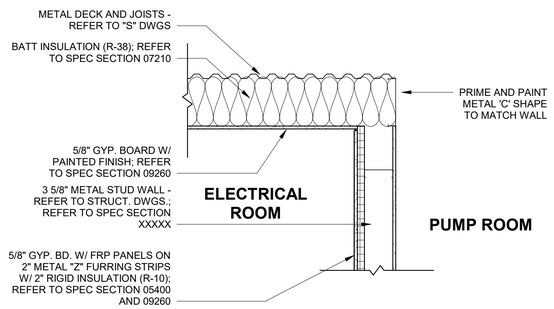
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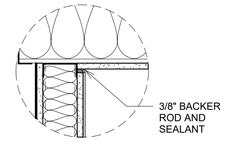
1 DT - FIRE EXTINGUISHER CABINET
1" = 1'-0"



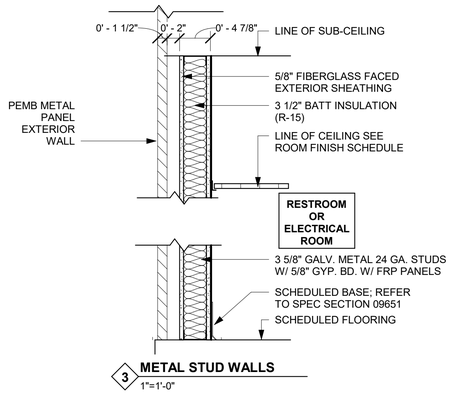
2 SPLASH BLOCK DETAIL
1" = 1'-0"



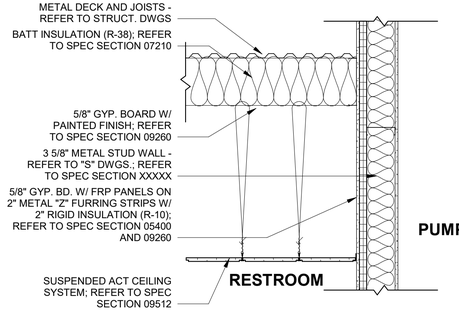
3 DT - CEILING AT ELEC ROOM
3/4" = 1'-0"



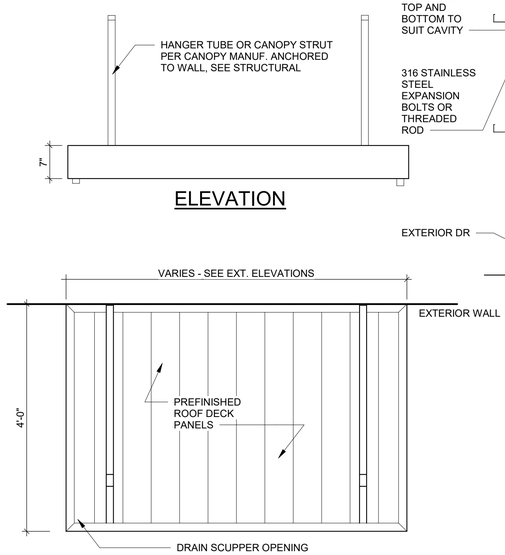
4 DT - SEALANT DETAIL
1 1/2" = 1'-0"

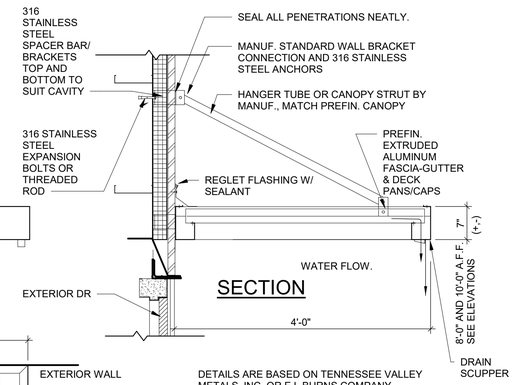


5 DT - INTERIOR PARTITION TYPE 3
1" = 1'-0"



6 DT - CEILING AT RESTROOM
3/4" = 1'-0"





DETAILS ARE BASED ON TENNESSEE VALLEY METALS, INC. OR E.L BURNS COMPANY, INC. (SHREVEPORT, LA). ALUMINUM CANOPY COVERS OR APPROVED EQUIVALENT. SEE SPECS. FOR OTHER MANUFACTURERS. SYSTEM SHOWN IS STOCK TYPE CANOPY. PROVIDE ALL ACCESSORIES, ANCHORAGE AND COMPONENTS AS REQUIRED FOR A NEAT, FINISHED INSTALLATION.

7 DOOR CANOPY DETAILS
3/4" = 1'-0"

NOTE: DIMENSIONS ARE SHOWN FOR REPRESENTATIVE CONSTRUCTION PURPOSES. OVERALL THE FACILITY SHALL BE 40X50 OUT TO OUT. ADJUSTMENTS IN FRAMING AND INTERNAL DIMENSIONS SHALL BE COORDINATED AND APPROVED DURING THE CONSTRUCTION PROCESS. SIGNED AND SEALED PRE-ENGINEERED METAL BUILDING DRAWINGS WILL BE REQUIRED. ADJUSTMENTS IN INTERNAL DIMENSIONS AND FRAMING SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO ALLOW FOR VARYING GIRT REQUIREMENTS OF THE PEMB MANUFACTURER.

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NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

DETAILS

SHEET NO. 19
DWG NO. A-8
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GENERAL

1. TO THE BEST OF OUR KNOWLEDGE, THE STRUCTURAL PLANS AND SPECIFICATIONS COMPLY WITH THE APPLICABLE REQUIREMENTS OF THE 8TH EDITION FLORIDA BUILDING CODE (2023).
2. THE STRUCTURAL DOCUMENTS ARE TO BE USED IN CONJUNCTION WITH THE ARCHITECTURAL, ELECTRICAL AND MECHANICAL DOCUMENTS. USE THESE NOTES IN CONJUNCTION WITH THE SPECIFICATIONS. IF A CONFLICT EXISTS, THE MORE STRINGENT GOVERNS.
3. COMPLY WITH REQUIREMENTS OF THE FLORIDA BUILDING CODE, OSHA, AND ALL OTHER APPLICABLE FEDERAL, STATE AND LOCAL CODES, STANDARDS, REGULATIONS AND LAWS.
4. ALL REFERENCED STANDARDS REFER TO THE EDITION IN FORCE AT THE TIME THESE PLANS AND SPECIFICATIONS ARE ISSUED FOR BIDDING.
5. REVIEW ALL CONTRACT DOCUMENTS, DIMENSIONS AND SITE CONDITIONS AND COORDINATE WITH FIELD DIMENSIONS AND PROJECT SHOP DRAWINGS PRIOR TO CONSTRUCTION. REPORT ANY DISCREPANCIES IN WRITING TO ARCHITECT/ ENGINEER. DO NOT CHANGE SIZE OR DIMENSIONS OF STRUCTURAL MEMBERS WITHOUT WRITTEN INSTRUCTIONS FROM THE STRUCTURAL ENGINEER OF RECORD.
6. ANY DISCREPANCIES, OMISSIONS OR VARIATIONS NOTED ON THE DRAWINGS OR IN THE SPECIFICATIONS DISCOVERED DURING THE BIDDING PERIOD SHALL BE IMMEDIATELY COMMUNICATED IN WRITING TO THE ARCHITECT / ENGINEER.
7. PROTECT EXISTING FACILITIES, STRUCTURES AND UTILITY LINES FROM ALL DAMAGE. EACH CONTRACTOR SHALL PROTECT HIS WORK, ADJACENT PROPERTY AND THE PUBLIC. EACH CONTRACTOR IS SOLELY RESPONSIBLE FOR DAMAGE OR INJURY DUE TO HIS ACT OR NEGLECT.
8. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR JOB SAFETY AND CONSTRUCTION PROCEDURES.
9. DO NOT SCALE DRAWINGS; USE DIMENSIONS.
10. REFER TO ARCHITECTURAL, ELECTRICAL AND MECHANICAL DRAWINGS FOR SIZE AND LOCATION OF OPENINGS IN STRUCTURE NOT SHOWN ON STRUCTURAL DRAWINGS.
11. DETAILS LABELED "TYPICAL DETAILS" OR "TYP" ON THE DRAWINGS APPLY TO ALL SITUATIONS THAT ARE THE SAME OR SIMILAR TO THOSE SPECIFICALLY DETAILED. SUCH DETAILS APPLY WHETHER OR NOT THEY ARE KEYED IN AT EACH LOCATION. QUESTIONS REGARDING APPLICABILITY OF TYPICAL DETAILS SHALL BE RESOLVED BY THE ARCHITECT / ENGINEER.
12. BUILDING DESIGN LOADS AND CRITERIA:

    A. MINIMUM FLOOR LIVE LOADS
       - GROUND FLOOR: 300 PSF
       - GENERATOR STAIR LOADS: 100 PSF

    B. ROOF/ CEILING
       -LIVE LOAD
          TYPICAL UNLESS OTHERWISE NOTED: 20 PSF
          LIGHT GAGE CEILING: (UNIFORM LOADING - 50 PSF) (CONCENTRATED LOAD - (2) 300 LB CONCENTRATED LOAD)
       -COLLATERAL
          TYPICAL UNLESS OTHERWISE NOTED: 5 PSF

    C. WIND CRITERIA (FBC),
       -REFER TO GENERAL NOTE 13, BELOW
       -ADDRESS: 415 19th STREET ST. AUGUSTINE BEACH, FLORIDA 32084
       -BASIC WIND SPEED: 142 MPH (PEMB)
          150 MPH (GENERATOR, GENERATOR CANOPY & DEGASIFIER-BIOTRICKLING FILTER SYSTEM SILOS)
       -EXPOSURE: C
       -RISK CATEGORY: III
       -ENCLOSURE CLASSIFICATION: ENCLOSED (PEMB) , OPEN-OBSTRUCTED WIND FLOW (GENERATOR CANOPY) SIGN/ROUND SILO (DEGASIFIER-BIOTRICKLING FILTER SYSTEM)

    D. FLOOD CRITERIA
       -FLOOD ZONE: AE (6.0-FEET)

    E. RAIN CRITERIA
       -15 MINUTE PRECIPITATION: 8.48 IN/HOUR
       -60 MINUTE PRECIPITATION: 4.48 IN/HOUR

13. ALL WIND FORCES SHALL BE DETERMINED ACCORDING TO THE PROVISIONS OF THE FBC USING THE MINIMUM WIND CRITERIA STATED IN NOTE 12, ABOVE. INCLUDE ALL APPROPRIATE SHAPE, HEIGHT, AND GUST FACTORS FOR THE MAIN WIND FORCE RESISTING SYSTEM AND COMPONENTS AND CLADDING. TO CALCULATE THE MAXIMUM NET UPLIFT, USE 60% OF THE SUPERIMPOSED DEAD LOADS.
14. CONTRACTOR SHALL PROVIDE ALL CODE REQUIRED PRODUCT APPROVAL NUMBERS TO THE GOVERNING BUILDING AGENCY. REFER TO WIND UPLIFT DIAGRAM & WIND LOADING CRITERIA FOR REQUIRED WIND LOADS. SIGNED & SEALED CALCULATIONS SHALL BE SUBMITTED FOR ALL PRODUCTS AS REQUIRED BY THE PRODUCT APPROVAL DOCUMENTATION.
15. "REF" IS THE ABBREVIATION FOR REFERENCE. WHEN PLACED NEXT TO A DIMENSION OR ELEVATION IT INDICATES THAT THE DIMENSION OR ELEVATION HAS BEEN DETERMINED FROM OTHER SOURCES SUCH AS EXISTING DRAWINGS. THE CORRECTNESS OF REFERENCE DATA IS NOT VERIFIED. THE CONTRACTOR SHALL VERIFY THE CORRECTNESS OF ALL REFERENCED DATA INDEPENDENTLY.

SHOP DRAWING REQUIRING ENGINEERING INPUT BY SPECIALTY ENGINEER

1. SPECIALTY ENGINEER:

    A. DEFINITION - A FLORIDA REGISTERED PROFESSIONAL ENGINEER WHO SPECIALIZES IN AND WHO UNDERTAKES THE DESIGN OF STRUCTURAL COMPONENTS OR STRUCTURAL SYSTEMS INCLUDED IN A SPECIFIC SUBMITTAL PREPARED FOR THIS PROJECT.

    B. SHALL BE:
       1. AN EMPLOYEE OR OFFICER OF A FABRICATOR.
       2. AN EMPLOYEE OR OFFICER OF AN ENTITY SUPPLYING COMPONENTS TO A FABRICATOR.
       3. AN INDEPENDENT CONSULTANT RETAINED BY THE FABRICATOR OR HIS SUPPLIER.

2. THE FOLLOWING SYSTEMS AND COMPONENTS AS A MINIMUM REQUIRE FABRICATION AND ERECTION DRAWINGS WITH INPUT BY A SPECIALTY ENGINEER, BUT ARE NOT LIMITED TO: JOISTS, WINDOWS, ROOF SYSTEMS, GLAZED OPENINGS, LOUVERS, DOORS AND ANY EXTERIOR ANCILLARY STRUCTURES.
3. THE SPECIALTY ENGINEER OR MANUFACTURER SHALL DESIGN, PROVIDE, AND INSTALL THEIR COMPONENTS AND THE COMPONENT CONNECTIONS TO THE PRIMARY STRUCTURE PER THE WIND CRITERIA STATED IN THESE NOTES OR THE CURRENT GOVERNING BUILDING CODES, WHICHEVER IS MORE STRINGENT.
4. SUBMITTALS SHALL CLEARLY IDENTIFY THE SPECIFIC PROJECT AND APPLICABLE CODES, LIST THE DESIGN CRITERIA, AND SHOW ALL DETAILS AND PLANS NECESSARY FOR PROPER FABRICATION AND INSTALLATION. CALCULATIONS AND SHOP DRAWINGS SHALL IDENTIFY SPECIFIC PRODUCT UTILIZED. GENERIC PRODUCTS WILL NOT BE ACCEPTED.
5. SHOP DRAWINGS AND CALCULATIONS MUST BE PREPARED UNDER THE DIRECT SUPERVISION AND CONTROL OF THE SPECIALTY ENGINEER.
6. CATALOG INFORMATION ON STANDARD PRODUCTS DOES NOT REQUIRE THE SEAL OF A SPECIALTY ENGINEER.
7. REVIEW OF THE SUBMITTAL BY THE STRUCTURAL ENGINEER OF RECORD OF IS LIMITED TO VERIFYING THE FOLLOWING:

    A. THAT THE SPECIFIED STRUCTURAL SUBMITTALS HAVE BEEN FURNISHED.
    B. THAT THE STRUCTURAL SUBMITTALS HAVE BEEN SIGNED AND SEALED BY THE SPECIALTY ENGINEER.
    C. THAT THE SPECIALTY ENGINEER HAS UNDERSTOOD THE DESIGN INTENT AND HAS USED THE SPECIFIED STRUCTURAL CRITERIA. (NO DETAILED CHECK OF CALCULATIONS WILL BE MADE.)
    D. THAT THE CONFIGURATION SET FORTH IN THE STRUCTURAL SUBMITTALS IS CONSISTENT WITH THE CONTRACT DOCUMENTS. (NO DETAILED CHECK OF DIMENSIONS OR QUANTITIES WILL BE MADE.)

8. SUBMITTALS NOT MEETING THE ABOVE CRITERIA WILL NOT BE REVIEWED AND WILL BE RETURNED TO CONTRACTOR MARKED REVISE AND RESUBMIT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DELAYS WHICH MAY RESULT.

TEMPORARY BRACING

1. THE CONTRACTOR SHALL PROVIDE TEMPORARY BRACING AS REQUIRED DURING CONSTRUCTION.
2. THE CONTRACTOR SHALL RETAIN AT THE CONTRACTOR'S EXPENSE A REGISTERED STRUCTURAL ENGINEER LICENSED IN THE STATE OF THE PROJECT TO DESIGN AND INSPECT ALL TEMPORARY SHORING AND BRACING. SIGNED, SEALED AND DATED DESIGN CALCULATIONS SHALL BE SUBMITTED FOR REVIEW WHEN REQUESTED.

SOIL PREPARATION AND COMPACTION

1. THE RECOMMENDATIONS OF THE GEOTECHNICAL ENGINEER OF RECORD SHALL BE FOLLOWED. GEOTECHNICAL ENGINEER OF RECORD REPORT: ECS FLORIDA LLC PROJECT#: 35: 36314; DATED: FEBRUARY 07, 2025.
2. SOIL COMPACTION SHALL BE FIELD CONTROLLED BY A SOILS ENGINEER OR TESTING LABORATORY.
3. EXCAVATE EXISTING SOIL TO BOTTOM OF FOOTINGS. ALL DELETERIOUS MATERIAL MUST BE COMPLETELY REMOVED.
4. ALL EXISTING UTILITIES & ORGANICS (INCLUDING STUMPS AND ROOTS) SHALL BE COMPLETELY REMOVED PRIOR TO FILL OPERATIONS.
5. SOIL COMPACTION, FILL, AND ITS REPLACEMENT SHALL BE FIELD CONTROLLED BY THE TESTING AGENCY OR GEOTECHNICAL ENGINEER OF RECORD. THE TESTING AGENCY SHALL RANDOMLY SELECT ALL TEST LOCATIONS.
6. THE CONTRACTOR SHALL DETERMINE WHETHER DE-WATERING WILL BE REQUIRED BASED ON ACTUAL GROUND WATER CONDITIONS AT THE TIME OF CONSTRUCTION. GROUNDWATER AT THE SITE WAS ENCOUNTERED BETWEEN 2'-6" AND 3'-3" BELOW EXISTING GRADE.

SHALLOW FOUNDATIONS

1. THE RECOMMENDATIONS OF THE GEOTECHNICAL ENGINEER OF RECORD SHALL BE FOLLOWED. GEOTECHNICAL ENGINEER OF RECORD REPORT: ECS FLORIDA LLC PROJECT#: 35: 36314; DATED: FEBRUARY 07, 2025. GROUNDWATER AT THE SITE WAS ENCOUNTERED BETWEEN 2'-6" AND 3'-3" BELOW EXISTING GRADE.
2. THE ALLOWABLE SOIL BEARING PRESSURE PER THE GEOTECH REPORT IS 2500 PSF.
3. DO NOT EXCAVATE FOR ANY PURPOSE WITHIN ONE FOOT OF THE ANGLE OF REPOSE OF ANY SOIL BEARING FOOTING OR FOUNDATION UNLESS SUCH FOOTING OR FOUNDATION IS FIRST PROPERLY PROTECTED AGAINST SETTLEMENT.
4. CENTER FOOTINGS UNDER THE SUPPORTED COLUMNS OR WALLS UNLESS OTHERWISE NOTED ON PLANS.
5. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR ALL EXCAVATION PROCEDURES INCLUDING LAGGING, SHORING, AND PROTECTION OF ADJACENT PROPERTY, STRUCTURES, STREETS AND UTILITIES IN ACCORDANCE WITH THE REQUIREMENTS OF THE LOCAL BUILDING DEPARTMENT.
6. THE CONTRACTOR IS RESPONSIBLE FOR THE DISPOSAL OF ACCUMULATED WATER FROM EXCAVATION AND DEWATERING OPERATIONS IN SUCH A WAY AS NOT TO CAUSE INCONVENIENCE TO THE WORK AND DAMAGE TO THE STRUCTURAL ELEMENTS. THE CONTRACTOR SHALL FIELD VERIFY GROUND WATER DEPTHS PRIOR TO CONSTRUCTION.

SLABS ON GRADE

1. PREPARE SUBGRADE AS PER THE RECOMMENDATION OUTLINED IN THE GEOTECHNICAL REPORT INCLUDED IN THE SPECIFICATIONS.
2. CHAIR REINFORCING DURING CONCRETE PLACEMENT TO INSURE PROPER POSITION IN SLAB.
3. USE 20 MIL POLYETHYLENE SHEETING BETWEEN SOIL AND CONCRETE SLAB.
4. PLACE CRACK CONTROL JOINTS AS INDICATED IN THE STANDARD DETAILS IN ALL FLOATING SLABS ON GRADE. DO NOT EXCEED A 2 TO 1 WIDTH TO LENGTH RATIO. CONTRACTOR SHALL SUBMIT A CONTROL JOINT LAYOUT FOR ENGINEER'S REVIEW UPON REQUEST.
5. RECESS SLABS ON GRADE FOR FLOOR FINISHES PER ARCHITECTURAL DRAWINGS.

REINFORCED CONCRETE

1. USE STRUCTURAL CONCRETE AND CONCRETING PRACTICES CONFORMING TO ACI-316 AND 301 AND PROPORTION CONCRETE IN ACCORDANCE WITH ACI-318 CH. 4 AND MEETING A MIN. ULTIMATE COMPRESSIVE STRENGTH IN 28 DAYS AS FOLLOWS:

   PROCESS BUILDING & MISCELLANEOUS CONCRETE PADS:
   -FOOTINGS, WALLS AND SLABS: 4000 PSI
   -MISCELLANEOUS SLABS/PADS/SIDEWALKS: 4000 PSI
   -ALL OTHER CONCRETE: 4000 PSI

   * PROVIDE CURRENT (MAXIMUM 1 YEAR OLD) STATISTICAL DATA FOR EACH CONCRETE MIX DESIGN SUBMITTED.

2. WHERE CONCENTRATION OF REINFORCING STEEL HINDERS PROPER CONSOLIDATION OF CONCRETE, USE CONCRETE CONTAINING A SUPERPLASTICIZING (N.R.W.R.) ADMIXTURE, ASTM C494 TYPE F. SLUMP AFTER ADDITION OF SUPERPLASTICIZER SHALL BE 7" ±1".
3. IF CONCRETE IS PUMPED, SLUMP MAY BE INCREASED TO 6" AT THE TRUCK. USE A MINIMUM 4-INCH PUMP, UNLESS PRE-APPROVED BY ENGINEER. TAKE CONCRETE SAMPLES FOR SLUMP AT TRUCK AND AT DISCHARGE END. TAKE CONCRETE SAMPLES FOR CYLINDER TESTING AT DISCHARGE END OF THE PUMP HOSE.
4. PROVIDE CONSTRUCTION JOINTS IN ACCORDANCE WITH ACI 318 CH. 6.4 AND SUBMIT SHOP DRAWINGS SHOWING LOCATIONS AND DIRECTION OF CONCRETE PLACEMENT FOR STRUCTURAL ENGINEER'S REVIEW. PROVIDE KEY WAYS AND ADEQUATE DOWELS IN ALL CONSTRUCTION JOINTS.
5. PROVIDE REINFORCING STEEL ERECTOR WITH A SET OF STRUCTURAL PLANS FOR FIELD USE. INSPECT REINFORCING STEEL PLACING FROM STRUCTURAL PLANS.
6. USE ASTM A-615 GR. 60 FOR ALL REINFORCING STEEL, CONFORM TO ACI-301, ACI-315, ACI-318, AND CRSI "MANUAL OF STANDARD PRACTICE". ALL REINFORCING SHALL BE ACCURATELY PLACED, RIGIDLY SUPPORTED AND FIRMLY TIED IN PLACE WITH BAR SUPPORTS AND SPACERS IN ACCORDANCE WITH THE ABOVE REQUIREMENTS. PROVIDE CLASS 'B' LAP SPLICE FOR CONTINUOUS BARS, UNLESS OTHERWISE NOTED. LAP BOTTOM STEEL OVER SUPPORTS AND TOP STEEL AT MID SPAN UNLESS OTHERWISE SPECIFIED. HOOK DISCONTINUOUS ENDS OF ALL TOP BARS AND ALL BARS IN WALLS, UNLESS OTHERWISE NOTED.
7. PLACE REINFORCING STEEL SUCH THAT BARS ADJACENT TO CONCRETE SURFACES & COLD JOINTS MEET MIN CLEAR COVER REQUIREMENTS, BUT DO NOT EXCEED THOSE REQUIREMENTS. USE THE FOLLOWING MINIMUM CLEAR COVER OVER REINFORCING:

	BOTTOM	TOP	SIDES
FOOTINGS	3"	3"	3"
BUILDING SLABS ON GRADE	2"	2"	2"
INDIVIDUAL EXTERIOR EQUIPMENT PADS	3"	2"	2"
RETAINING WALLS	1 1/2"	1 1/2"	1 1/2"
PIERS	-	1 1/2"	2"

8. HORIZONTAL BARS SHALL BE MADE CONTINUOUS WITH HOOKS AROUND CORNERS.
9. USE PLAIN, COLD-DRAWN ELECTRICALLY-WELDED STEEL WIRE REINFORCEMENT CONFORMING TO ASTM A1064. SUPPLY IN FLAT SHEETS ONLY. LAP SPLICES SHALL BE MEASURED BETWEEN OUTERMOST CROSS WIRES OF EACH REINFORCEMENT SHEET AND SHALL BE NOT LESS THAN TWICE THE SPACING OF THE CROSS WIRES PLUS TWO (2) INCHES.
10. SLEEVE ALL PIPES THROUGH SLABS INDIVIDUALLY, UNLESS APPROVED BY ENGINEER.
11. SUBMIT SHOP DRAWINGS TO THE ENGINEER FOR REVIEW PRIOR TO FABRICATING REINFORCING STEEL. DO NOT REPRODUCE THE STRUCTURAL DRAWINGS FOR USE AS SHOP DRAWINGS.
12. PROVIDE CLASS 'B' LAP SPLICE AT SUPPORTS AND HOOK DISCONTINUOUS ENDS AT THE FAR FACE OF SUPPORTS FOR ALL BEAMS UNLESS OTHERWISE NOTED.
13. REINFORCING PLACED IN LOCATIONS WHERE PROPER COVER CANNOT BE ACHIEVED SHALL BE HOT DIPPED GALVANIZED ACCORDING TO ASTM A767 WITH 2 OUNCES OF ZINC COATING PER SQUARE FOOT OF SURFACE AREA MINIMUM.
14. ALL EXPOSED CONCRETE AND GROUT EDGES SHALL HAVE 3/4", 45° CHAMFER, UNLESS OTHERWISE NOTED.
15. ALL CONCRETE SHALL BE WET CURED.

SEALANTS

1. HORIZONTAL JOINT SEALANT SHALL BE A TRAFFIC BEARING, TWO COMPONENT, POLYURETHANE BASED, SELF LEVELING ELASTOMERIC SEALANT SUCH AS SIKAFLEX-2C SL OR APPROVED EQUIVALENT. SEALANT SHALL BE GRAY IN COLOR TO MATCH TOPPING UNLESS OTHERWISE NOTED.
2. VERTICAL JOINT SEALANT SHALL BE A TWO COMPONENT, POLYURETHANE BASED, NON SAGGING ELASTOMERIC SEALANT SUCH AS SIKAFLEX-2C NS OR APPROVED EQUIVALENT. PROVIDE SEALANT COLOR AS REQUIRED BY ARCHITECT.

STRUCTURAL STEEL

1. ALL STEEL WORK (INCLUDING FABRICATION AND ERECTION) SHALL CONFORM TO THE AISC "MANUAL OF STEEL CONSTRUCTION, 15TH EDITION" AND PROJECT SPECIFICATIONS, USE THE FOLLOWING:

    A. STRUCTURAL STEEL WIDE FLANGE AND WT SECTIONS: ASTM A992 Fy=50KSI
    B. CHANNELS, ANGLES, PLATES, AND MISCELLANEOUS STEEL: ASTM A36, Fy=36KSI
    C. COLD-FORMED STEEL TUBING: ASTM A500 GRADE C, Fy=50 KSI
    D. STEEL PIPE: ASTM A53, TYPE E OR S GRADE B, Fy=35KSI

2. THE CONNECTIONS FOR ANY PORTION OF THE STRUCTURE NOT INDICATED ON THE DRAWINGS SHALL BE DESIGNED AND DETAILED BY THE FABRICATOR'S SPECIALTY ENGINEER. THESE CONNECTIONS SHALL BE DESIGNED FOR THE FORCES INDICATED ON THE STRUCTURAL DRAWINGS. WHERE FORCES ARE NOT SHOWN ON THE DRAWINGS, EACH END CONNECTION SHALL BE DESIGNED FOR ONE-HALF THE TOTAL LOAD SHOWN IN THE APPROPRIATE AISC "ALLOWABLE LOADS ON BEAMS" TABLES.
3. USE STRUCTURAL STEEL THAT IS FULLY WELDABLE WITHIN GRADES AND FROM ANY GRADE TO ANY OTHER GRADE. WELD ALL SHOP CONNECTIONS, UNLESS OTHERWISE NOTED.
4. ALL SHOP AND FIELD WELDING SHALL CONFORM TO THE STRUCTURAL WELDING CODE AWS D1.1, LATEST EDITION, PUBLISHED BY THE AMERICAN WELDING SOCIETY (AWS). USE ELECTRODES CONFORMING TO AWS D1.1, E70 SERIES, UNLESS OTHERWISE NOTED. SHOW ALL SHOP WELDS ON THE FABRICATION DRAWINGS AND ALL FIELD WELDS ON THE ERECTION DRAWINGS.
5. ALL SHOP AND FIELD WELDERS, WELDING OPERATORS, AND TACKERS SHALL BE CERTIFIED ACCORDING TO AWS PROCEDURE FOR THE WELDING PROCESS AND WELDING POSITION USED. ALL RECORDS OF SUCH CERTIFICATION SHALL BE FILED AT THE JOB SITE AND MADE AVAILABLE TO THE ENGINEER UPON REQUEST.
6. ALL JOINT WELDING PROCEDURES TO BE USED SHALL BE PREPARED BY THE FABRICATOR OR CONTRACTOR AS WRITTEN PROCEDURE SPECIFICATIONS. ALL RECORDS SHALL BE FILED AT THE JOB SITE & MADE AVAILABLE TO THE ENGINEER UPON REQUEST. ALL JOINT WELDING PROCEDURES SHALL BE QUALIFIED PRIOR TO USE ACCORDING TO AWS PROCEDURES.
7. ANCHOR BOLTS:

    A. PUMP ANCHOR BOLTS / THREADED RODS SHALL BE SHALL BE 316 STAINLESS STEEL WITH 316 STAINLESS STEEL HEAVY HEX NUTS AND 316 STAINLESS STEEL HARDENED STEEL WASHERS.
    B. PRE-ENGINEERED METAL BUILDING ANCHOR BOLTS SHALL BE F1554 GRADE 36 HOT DIPPED GALVANIZED WITH HOT DIPPED GALVANIZED NUTS AND WASHERS EACH END. REFER TO PLAN FOR EMBEDMENT AND PROJECTION REQUIREMENTS. CONTRACTOR SHALL SUPPLY A MINIMUM (4) BOLTS PER BASE PLATE AND MINIMUM ANCHOR BOLT SIZE SHALL BE 3/4"-INCH DIAMETER.
    C. PIPE SUPPORT ANCHOR BOLTS / THREADED RODS SHALL MATCH MATERIAL TYPE (F1554 GRADE 36 HOT DIPPED GALVANIZED STEEL BOLTS FOR CARBON STEEL PIPE SUPPORTS AND STAINLESS STEEL GRADE 316 BOLTS FOR STAINLESS STEEL PIPE SUPPORTS). PIPE SUPPORT ANCHOR BOLTS / THREADED RODS SHALL HAVE HEAVY HEX NUTS AND HARDENED STEEL WASHERS.
    D. ANY ANCHOR BOLTS / THREADED ROD NOT LISTED ABOVE SHALL BE STAINLESS STEEL GRADE 316 MATERIAL WITH 316 STAINLESS STEEL HEAVY HEX NUTS AND 316 STAINLESS STEEL HARDENED STEEL WASHERS.
    E. HARDENED STEEL WASHERS SHALL BE REGULAR SERIES, TYPE B, PLAIN, HARDENED WASHERS COMPLYING WITH ANSI B18.22.1 USING A325 CARBON STEEL AND 316 STAINLESS STEEL PLATE WITHOUT ANY BREAK OR GAP.
    F. ANCHOR BOLTS SHALL BE THREADED FOR FULL PROJECTION ABOVE ROUGH CONCRETE UNLESS OTHERWISE NOTED.
    G. TIGHTEN ANCHOR BOLTS AS FOLLOWS:
       • BRING ALL ANCHOR BOLTS TO A SNUG TIGHT CONDITION OBTAINED BY A FEW IMPACTS OF AN IMPACT WRENCH OR THE FULL EFFORT OF A PERSON USING AN ORDINARY SPUD WRENCH
    H. BASE PLATES SHALL BE GROUTED IMMEDIATELY AFTER FINAL ANCHOR BOLT TIGHTENING.

8. GROUT UNDER EQUIPMENT AND PUMP BASE PLATES SHALL BE HIGH STRENGTH, NON-SHRINK AND NON-METALLIC AS MANUFACTURED BY FIVE STAR, MASTER BUILDERS, SIKA OR APPROVED EQUIVALENT. PRE-ENGINEERED METAL BUILDING COLUMN BASE PLATE SHALL BEAR DIRECTLY AGAINST THE SLAB ON GRADE CONCRETE WITH NO GROUT BENEATH THE BASE PLATE.
9. CUT, DRILL, OR PUNCH HOLES PERPENDICULAR TO METAL SURFACES. DO NOT FLAME CUT HOLES OR ENLARGE HOLES BY BURNING.
10. SPLICING OF STRUCTURAL STEEL MEMBERS IN THE FIELD OR IN THE SHOP IS PROHIBITED EXCEPT WHERE INCLUDED ON THE DRAWINGS.
11. DO NOT PAINT STEEL SURFACES IN CONTACT WITH CONCRETE. DO NOT APPLY FINISH COAT AND LIMIT PRIME COAT TO 2 MILS AT FAYING SURFACES OF SLIP CRITICAL BOLTED CONNECTIONS, SURFACES TO BE WELDED AND TOP SURFACES OF BEAMS AND TRUSSES TO RECEIVE STEEL STUDS AND/OR SUPPORTING METAL FLOOR AND ROOF DECKING. USE PRIMER WHICH HAS A MIN. CLASS A SLIP COEFFICIENT (0.33).
12. REFER TO ARCHITECTURAL PLANS FOR FIREPROOFING OF STRUCTURAL STEEL MEMBERS, REFER TO SPECIFICATIONS FOR PAINTING OF STRUCTURAL STEEL.
13. SUBMIT STRUCTURAL STEEL SHOP DRAWINGS TO ENGINEER FOR REVIEW BEFORE FABRICATION. ALL STRUCTURAL STEEL SHOP DRAWINGS, REQUIRING INPUT FROM A SPECIALTY ENGINEER, SHALL BE SIGNED AND SEALED PRIOR TO SUBMITTAL. DO NOT REPRODUCE THE STRUCTURAL DRAWINGS FOR USE AS SHOP DRAWINGS.
14. PROVIDE TEMPORARY BRACING AS NECESSARY TO INSURE A STABLE STRUCTURE DURING CONSTRUCTION.
15. NO CUTTING OF SECTIONS, FLANGES, WEBS, OR ANGLES SHALL BE ALLOWED WITHOUT WRITTEN APPROVAL FROM THE ENGINEER OF RECORD.
16. FABRICATE AND ERECT STRUCTURAL STEEL IN ACCORDANCE WITH AISC SPECIFICATIONS AND "CODE OF STANDARD PRACTICE".
17. IMMEDIATELY AFTER ERECTION ALL FRAMING MEMBERS AND WELDS SHALL BE TOUCHED UP WITH A PAINT COMPATIBLE WITH THE SHOP PAINT OR COATING.

MISCELLANEOUS STEEL

1. FOR MISCELLANEOUS STEEL NOT SHOWN ON STRUCTURAL DRAWINGS, REFER TO ARCHITECTURAL AND MECHANICAL DRAWINGS.
2. EDGE ANGLES, CLIP ANGLES, PLATES, BARS, AND OTHER MISCELLANEOUS ROLLED SHAPES SHALL BE ASTM A-36 STRUCTURAL STEEL, UNLESS OTHERWISE NOTED.
3. THE PROVISIONS OF THE ABOVE STRUCTURAL STEEL SECTION SHALL ALSO APPLY TO MISCELLANEOUS STEEL.

ALUMINUM

1. ALL ALUMINUM ITEMS SHALL BE ALLOY 6061-T6 WITH TEMPER T6 CONFORMING TO ASTM B209 AND B308. REFER TO ARCHITECTURAL FOR FINISH.
2. WELDING OF ALUMINUM SHALL USE GAS TUNGSTEN ARC OR GAS METAL ARC WELDING WITH NO POSTWELD HEAT TREATMENT. THE FILLER WIRE SHALL BE 5556.
3. ALUMINUM IN CONTACT WITH CONCRETE, GROUT, OR DISSIMILAR METALS SHALL BE COATED WITH A CHROMATE CONVERSION COATING OR A 125 MIL BITUMASTIC COATING.
4. STEEL FASTENERS OR HARDWARE IN CONTACT WITH ALUMINUM SHALL BE AISI 316 STAINLESS STEEL.

PIPING, PIPELINE APPURTENANCES, VALVE, SUPPORTS, HANGERS, STRUTS, BLOCKING AND ANCHORAGE NOTES

1. CONTRACTOR SHALL REFER TO THE APPLICABLE DIVISIONS OF THE SPECIFICATIONS FOR SUPPORTS, BLOCKING, ANCHORAGE, AND RESTRAINING OF ALL PIPE, VALVES AND PIPING APPURTENANCES.
2. CONTRACTOR SHALL REVIEW WITH THE ENGINEER ALL LOCATION AND ARRANGEMENT OF PIPING OPENINGS, PIPE SLEEVES, TRENCHES, AS REQUIRED TO COMPLETE HIS WORK AND SHALL NOT PROCEED WITH INSTALLATION OF SAME UNTIL SUCH HAS BEEN REVIEWED AND WILL NOT IMPAIR THE STRUCTURAL INTEGRITY OF THE CONCRETE MEMBERS.
3. CONTRACTOR SHALL PROVIDE AND COORDINATE THE INSTALLATION OF ALL ITEMS TO BE EMBEDDED IN THE CONCRETE SYSTEM AND SHALL COOPERATE SO AS NOT TO DELAY THE CONSTRUCTION WORK. SUCH ITEMS SHALL INCLUDE PIPES, SLEEVES, BOLTS, STRUTS, HANGERS AND FITTINGS, ETC., THAT ARE TO BE EMBEDDED IN THE CONCRETE SYSTEM.

METAL DECK FOR INTERIOR CEILING OVER ELECTRICAL ROOM, RESTROOM AND MAINTENANCE ROOM

1. USE VULCRAFT OR ENGINEER APPROVED EQUIVALENT GALVANIZED STEEL DECK UNITS FORMED OF GAGE STEEL SHEETS AS SPECIFIED ON THE DRAWINGS AND CONFORMING TO THE SPECIFICATIONS UNLESS OTHERWISE NOTED.
2. STEEL DECK SHALL SPAN A MINIMUM OF THREE (3) SPANS.
3. DECK SHALL BE PLACED AT THE PERIMETER WITH COMPLETE RIB BEARING ON THE SUPPORTS PROVIDED.
4. ALL CEILING DECK FASTENERS SHALL BE MINIMUM #12 HEX WASHER HEAD (HWH) THREADED FASTENER OR EQUIVALENT. REFER TO PLAN FOR FASTENER SIZE.
5. CONNECT DECK TO THE PRIMARY STRUCTURE AS SPECIFIED ON THE DRAWINGS.
6. CEILING, DUCTS, AND LIGHT FIXTURES MAY BE HUNG FROM THE DECK. DO NOT HANG ANY OTHER ITEMS FROM THE CEILING DECK. NO SINGLE CONNECTION LOAD SHALL EXCEED 60 POUNDS AND NO UNIFORM LOAD SHALL EXCEED 10 PSF.
7. METAL DECK CLOSURE, EDGE, OR TRANSITION PLATES SHALL BE PROVIDED AT ALL OPENINGS EDGES, CHANGES IN DECK SLOPES, AND CHANGES IN DECK DIRECTION.
8. METAL DECK AND ATTACHED PLATES SHALL BE GALVANIZED WITH A MINIMUM G-90 ZINC FINISH, 0.9 OUNCE/SF.
9. METAL ROOF DECK SHALL HAVE A MINIMUM YIELD STRESS OF 80,000 PSI.

ABBREVIATION

AL	ALUMINUM
BLDG	BUILDING
BOT	BOTTOM
B/	BOTTOM OF
CC	CENTER TO CENTER
CJ	PARTIAL CONTROL JOINT
CMU	CONCRETE MASONRY UNIT
COMP	COMPOSITE
CONC	CONCRETE
CONST CJ	CONSTRUCTION JOINT
CONT	CONTINUOUS
DIA	DIAMETER
DWG	DRAWING
EF	EACH FACE
EJ	EXPANSION JOINT
EL	ELEVATION
EW	EACH WAY
FF	FAR FACE
FTG	FOOTING
HDG	HOT-DIP GALVANIZED
HORIZ	HORIZONTAL
HP	HIGH POINT
ID	INSIDE DIAMETER
LP	LOW POINT
MAT'L	MATERIAL
MAX	MAXIMUM
MIN	MINIMUM
MISC	MISCELLANEOUS
NF	NEAR FACE
NTS	NOT TO SCALE
OC	ON CENTER
PL	PLATE
PLF	POUNDS PER LINEAR FOOT
PROJ	PROJECTION
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
REINF	REINFORCEMENT
SIM	SIMILAR
SPECS	SPECIFICATIONS
SS	STAINLESS STEEL
STD	STANDARD
T&B	TOP AND BOTTOM
T/STRUCTURE	TOP OF STRUCTURE
TYP	TYPICAL
UON	UNLESS OTHERWISE NOTED
VERT	VERTICAL
VIF	VERIFY IN FIELD
WSTP	WATERSTOP
WWR	WELDED WIRE REINFORCEMENT

NOTE:
THESE ABBREVIATIONS ARE FOR USE ON STRUCTURAL DRAWINGS ONLY.

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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	C. LYNER
DRAWN BY:	B. LEE
DATE:	JUNE 2026
CHECKED BY:	C. MADDEN
DATE:	JUNE 2026

DESIGN ENGINEER
CHAD E. LYNER
FLORIDA REGISTRATION NO.
66277

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

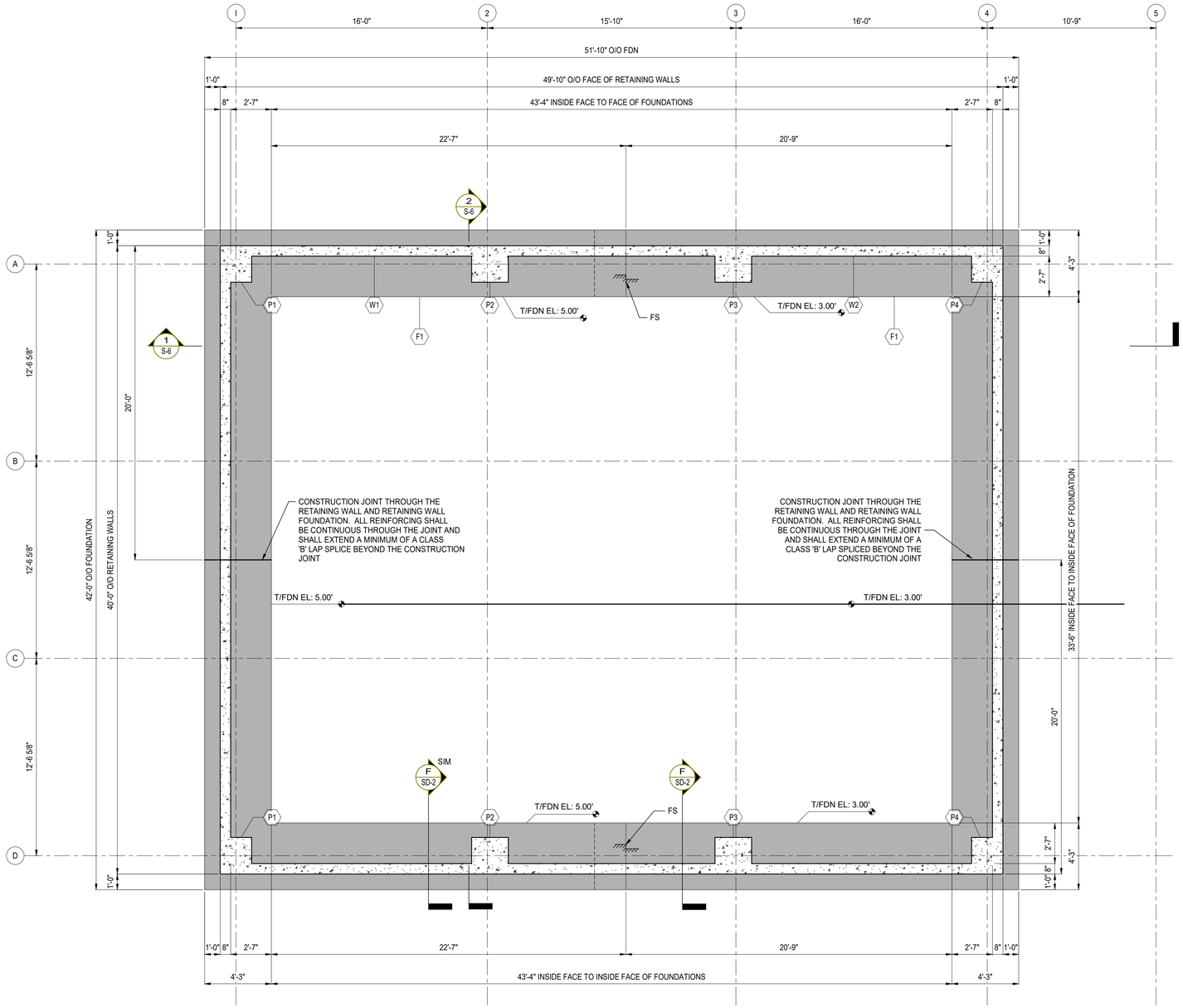
NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

GENERAL NOTES

SHEET NO. 20
DWG NO. S-1
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FOUNDATION PLAN
1/4" = 1'-0"



FOUNDATION, RETAINING WALL & SLAB NOTES

1. FINISHED FLOOR ELEVATION = 7'-0". REFER TO CIVIL DRAWINGS FOR REFERENCE ELEVATION.
2. REFER TO CIVIL DRAWINGS FOR FLOOR SLOPES AND ELEVATIONS.
3. REFER TO SD-1 & SD-2 FOR TYPICAL SLAB-ON-GRADE AND FOUNDATION DETAILS.
4. REFER TO SD-3 FOR ADDITIONAL REQUIREMENTS.
5. REFER TO ELECTRICAL FOR ALL CONDUIT PENETRATIONS.

LEGEND

- 4'-3" W x 1'-4" T x CONT FOOTING. REINFORCED w/ #5@10" O.C. E.W. T&B
- RETAINING WALLS & PIERS
- FOOTING STEP (FS). REFER TO SD-2

CONTRACTOR NOTE:

THE METAL BUILDING FOUNDATION AND PIERS ARE SIZED BASED ON PRELIMINARY METAL BUILDING DESIGN AND REACTIONS. CONTRACTOR SHALL SUBMIT FINAL METAL BUILDING DRAWINGS AND REACTIONS (SIGNED AND SEALED) TO THE ENGINEER OF RECORD FOR REVIEW A MINIMUM OF (1) WEEK AFTER RECEIPT OF PRE-ENGINEERED METAL BUILDING DRAWINGS. BASED ON THE FINAL DRAWINGS AND REACTIONS, THE FOUNDATIONS AND PIERS MAY CHANGE.

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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	C. LYNER
DRAWN BY:	B. LEE
DATE:	JUNE 2026
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DATE:	JUNE 2026

DESIGN ENGINEER
CHAD E. LYNER
FLORIDA REGISTRATION NO.
66277

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

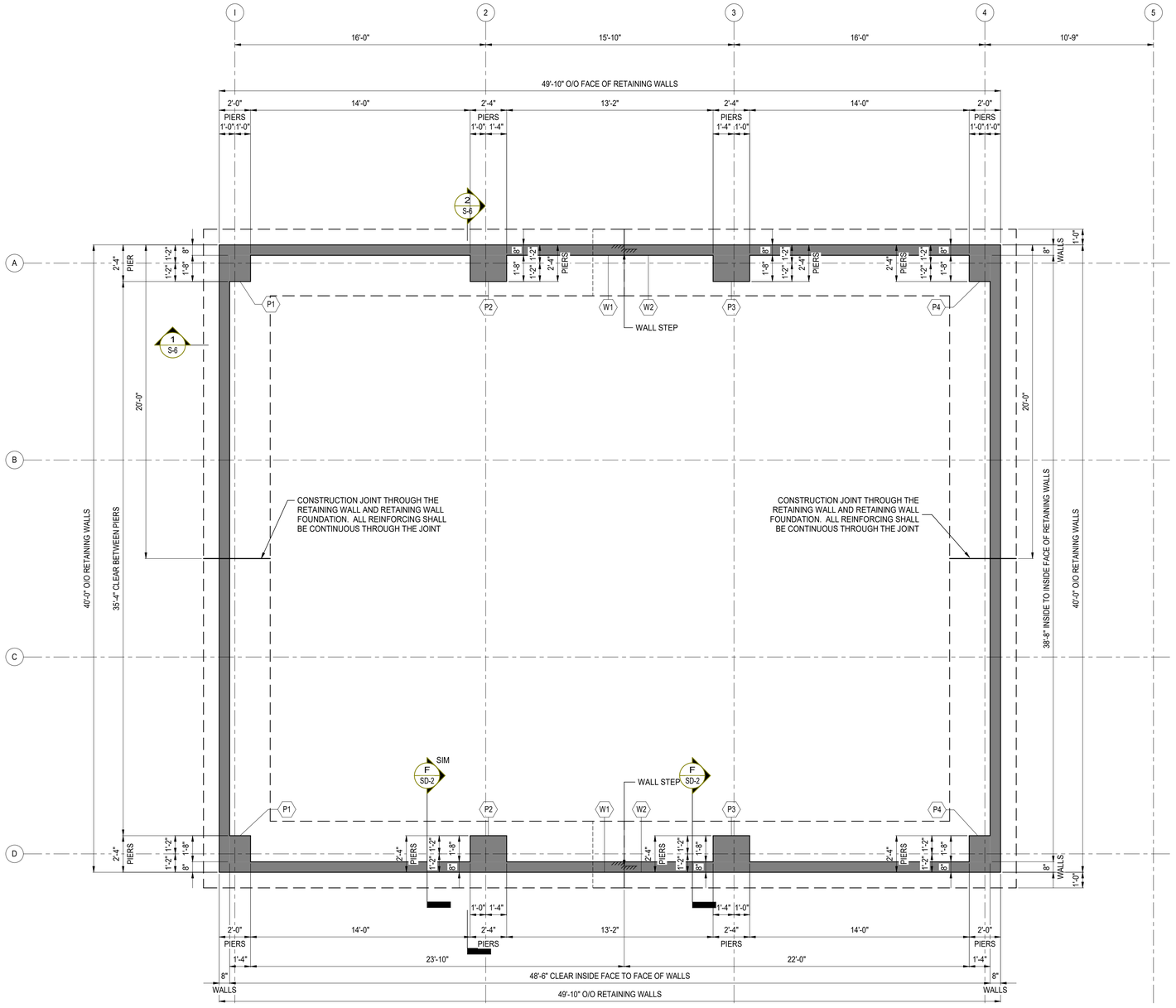
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

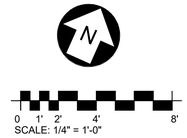
TREATMENT BUILDING
FOUNDATION PLAN

SHEET NO. 21
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PIER & RETAINING WALL LEGEND

TYPE MARK	DIMENSIONS (LxWxH)	ELEMENT REINF
P1	2'-4"x2'-0"X1'-0"	(14) #7 VERT w/ (3) #3 STIRRUPS @ 4" T/PIER & BAL @ 10" O.C.
P2	2'-4"x2'-4"X1'-0"	(16) #7 VERT w/ (3) #3 STIRRUPS @ 4" T/PIER & BAL @ 10" O.C
P3	2'-4"x2'-4"X3'-0"	(16) #7 VERT w/ (3) #3 STIRRUPS @ 4" T/PIER & BAL @ 10" O.C
P4	2'-4"x2'-0"X3'-0"	(14) #7 VERT w/ (3) #3 STIRRUPS @ 4" T/PIER & BAL @ 10" O.C
W1	CONTx8"x1'-6"	#5 @ 10" O.C. EA WAY EA FACE
W2	CONTx8"x3'-0"	#5 @ 10" O.C. EA WAY EA FACE

FOUNDATION, RETAINING WALL & SLAB NOTES

1. FINISHED FLOOR ELEVATION = 7'-0". REFER TO CIVIL DRAWINGS FOR REFERENCE ELEVATION.
2. REFER TO CIVIL DRAWINGS FOR FLOOR SLOPES AND ELEVATIONS.
3. REFER TO SD-1 & SD-2 FOR TYPICAL SLAB-ON-GRADE AND FOUNDATION DETAILS.
4. REFER TO SD-3 FOR ADDITIONAL REQUIREMENTS.
5. REFER TO ELECTRICAL FOR ALL CONDUIT PENETRATIONS.

LEGEND

RETAINING WALLS & PIERS

EXTENTS OF FOUNDATION (BELOW)

CONTRACTOR NOTE:

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RETAINING WALL AND PIER PLAN

1/4" = 1'-0"

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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	C. LYNER
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DESIGN ENGINEER
CHAD E. LYNER
FLORIDA REGISTRATION NO.
66277

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

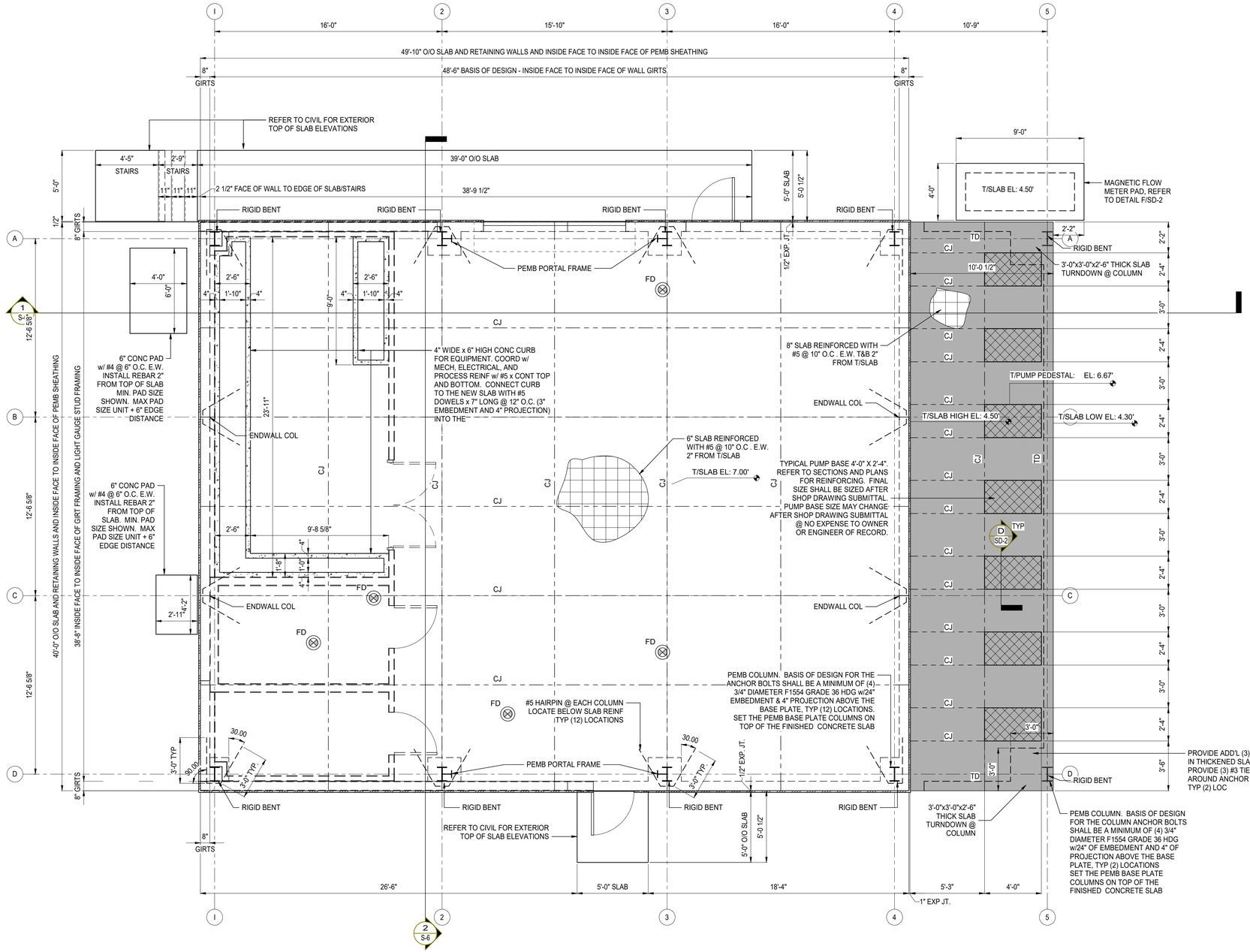
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

TREATMENT RETAINING WALL PLAN

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SLAB PLAN
1/4" = 1'-0"

N

0 1' 2' 4' 8'
SCALE: 1/4" = 1'-0"

FOUNDATION, RETAINING WALL & SLAB NOTES

1. FINISHED FLOOR ELEVATION = 7'-0". REFER TO CIVIL DRAWINGS FOR REFERENCE ELEVATION.
2. REFER TO CIVIL DRAWINGS FOR FLOOR SLOPES AND ELEVATIONS.
3. REFER TO SD-1 & SD-2 FOR TYPICAL SLAB-ON-GRADE AND FOUNDATION DETAILS.
4. REFER TO SD-3 FOR ADDITIONAL REQUIREMENTS.
5. REFER TO ELECTRICAL FOR ALL CONDUIT PENETRATIONS.

LEGEND

- EXTERIOR FDN SLAB
- CJ — CONTROL JOINTS REFER TO SD-1
- EXTENTS OF RETAINING WALLS & PIERS (BELOW)
- TD — TURN DOWN SLAB EDGES
- FD — FLOOR DRAIN COORDINATE LOCATIONS WITH PLUMBING

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AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
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DESIGNER:	C. LYNER
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CHAD E. LYNER
FLORIDA REGISTRATION NO.
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St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

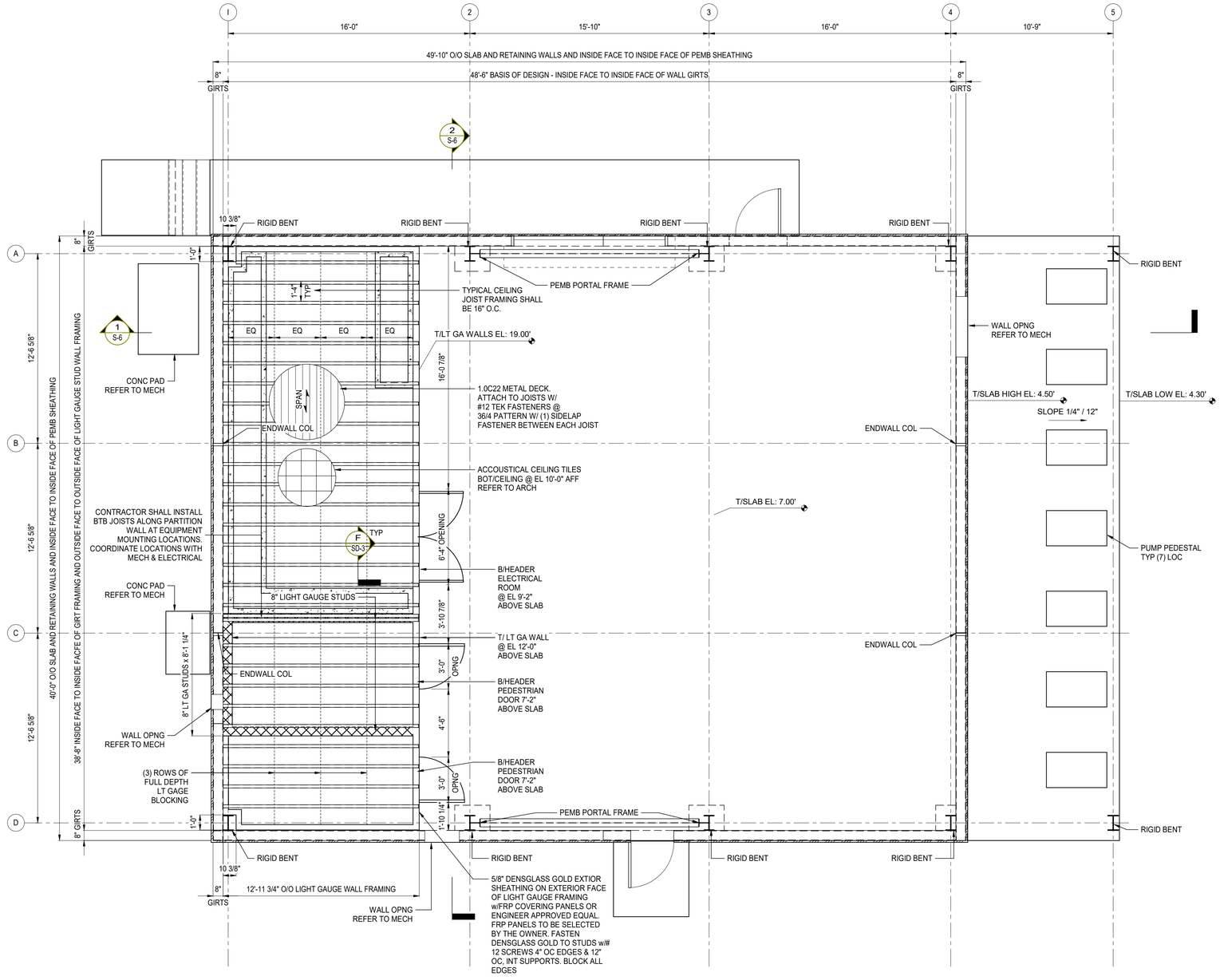
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

TREATMENT BUILDING SLAB PLAN

SHEET NO. 23
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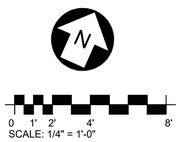
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LIGHT GAGE FRAMING PLAN

1/4" = 1'-0"

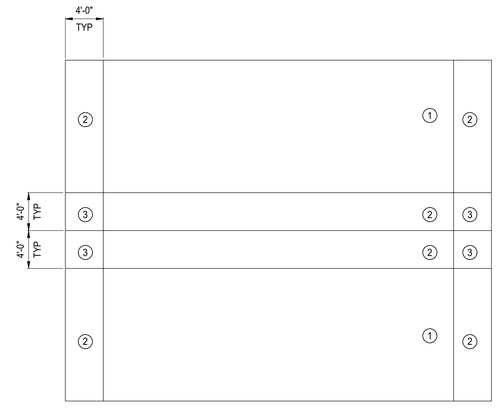


NOTES

1. ALL OPENINGS IN THE PRE-ENGINEERED METAL BUILDING SHALL BE COORDINATED AND LOCATED PER THE ARCHITECTURAL AND MECHANICAL DRAWINGS.
2. ALL OPENINGS IN THE INTERIOR LIGHT GAGE STUD WALLS SHALL BE COORDINATED AND LOCATED PER THE ARCHITECTURAL DRAWINGS.
3. REFER TO SD-3 FOR ADDITIONAL REQUIREMENTS.

LEGEND

- 3 5/8" LIGHT GAGE STUD WALLS; REFER TO SD-3 FOR DETAILS
- 8" LIGHT GAGE STUD WALLS; REFER TO SD-3 FOR DETAILS
- FULL DEPTH LIGHT GAGE BLOCKING, REFER TO SD-3 FOR DETAILS



C&C WALL PRESSURES			
ZONE	EFFECTIVE AREA (SF)	PRESSURE (PSF)	
		POS (+)	NEG (-)
4	10	24.7	-26.8
	50	22.2	-24.2
	100	20.0	-22.1
	500	18.5	-20.6
5	10	24.7	-33.0
	50	22.2	-27.9
	100	20.0	-23.5
	500	18.5	-20.6

WIND NOTES:

1. WALL ZONE 5 EXTENDS FROM THE BUILDING CORNERS A DISTANCE OF 4'-0". WALL ZONE 4 IS THE REMAINDER OF THE WALL.
2. COMPONENT AND CLADDING PRESSURES SHOWN ARE ALLOWABLE PRESSURES AND MAY NOT BE REDUCED.

C&C ROOF PRESSURES			
ZONE	EFFECTIVE AREA (SF)	PRESSURE (PSF)	
		POS (+)	NEG (-)
1	10	17.9	-49.9
	100	12.6	-26.7
	200	11.0	-19.7
	300	11.0	-15.6
2	10	17.9	-65.9
	100	12.6	-36.1
	200	11.0	-27.0
	300	11.0	-27.0
3	10	17.9	-86.6
	100	12.6	-45.4
	200	11.0	-45.4
	300	11.0	-45.4

COMPONENT & CLADDING WIND PRESSURES

NO.	BY	DATE	SYMBOL	REVISIONS
6.				
5.				
4.				
3.				
2.				
1.				

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Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	C. LYNER
DRAWN BY:	B. LEE
DATE:	JUNE 2026
CHECKED BY:	C. MADDEN
DATE:	JUNE 2026

DESIGN ENGINEER
CHAD E. LYNER
FLORIDA REGISTRATION NO.
66277

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

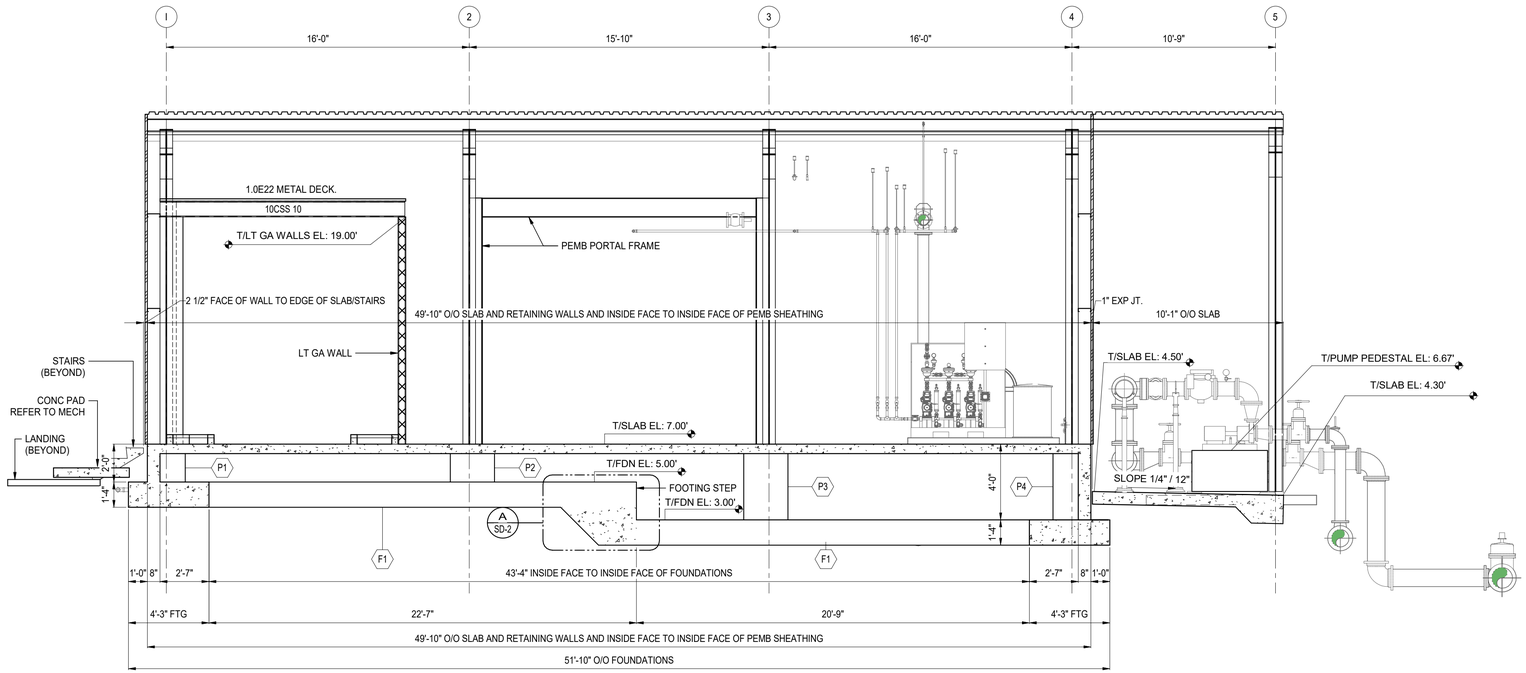
TREATMENT BUILDING LIGHT GAGE FRAMING PLAN AND PEMB ROOF UPLIFT PLAN

SHEET NO. 24
DWG NO. S-5
100% SUBMITTAL

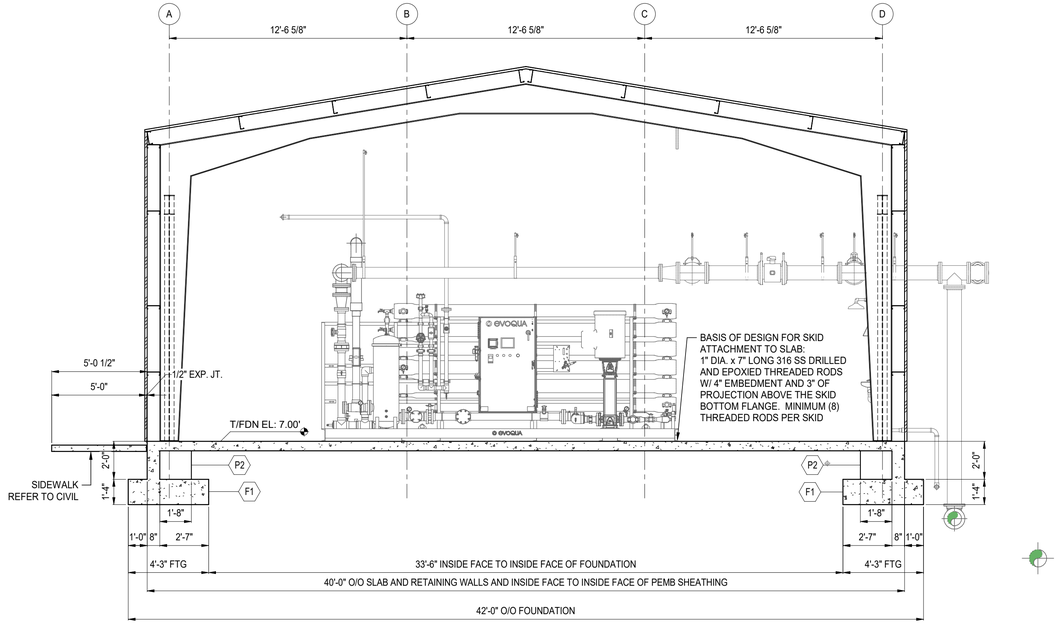
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1 S-2 LONGITUDINAL SECTION
1/4" = 1'-0"



2 S-2 LATERAL SECTION
1/4" = 1'-0"

NO.	BY	DATE	SYMBOL	REVISIONS
6.				
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ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

TREATMENT BUILDING SECTIONS

SHEET NO. 25
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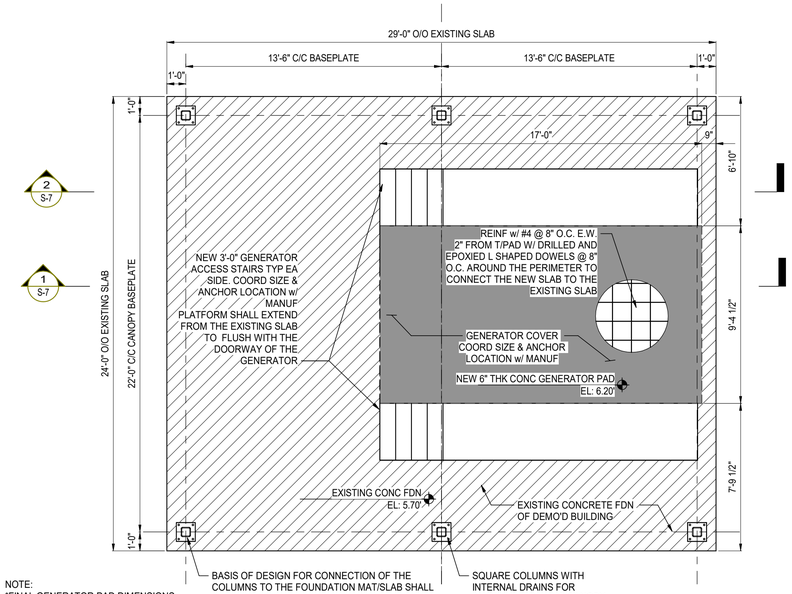
6/8/2026 4:03:19 PM
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ALUMINUM PLATFORMS AT GENERATOR:

1. DESIGN OF ALUMINUM PLATFORMS FOR GENERATOR SHALL BE DELEGATED TO A REGISTERED DESIGN PROFESSIONAL ENGINEER IN THE STATE OF FLORIDA.
2. PLATFORM SHALL BE 6061-T6 ALUMINIUM.
3. PLATFORM SHALL BE DESIGNED TO MEET THE LOADING REQUIREMENTS ON S-1.
4. THE PLATFORM SHALL BE SUPPLIED BY THE GENERATOR SUPPLIER.

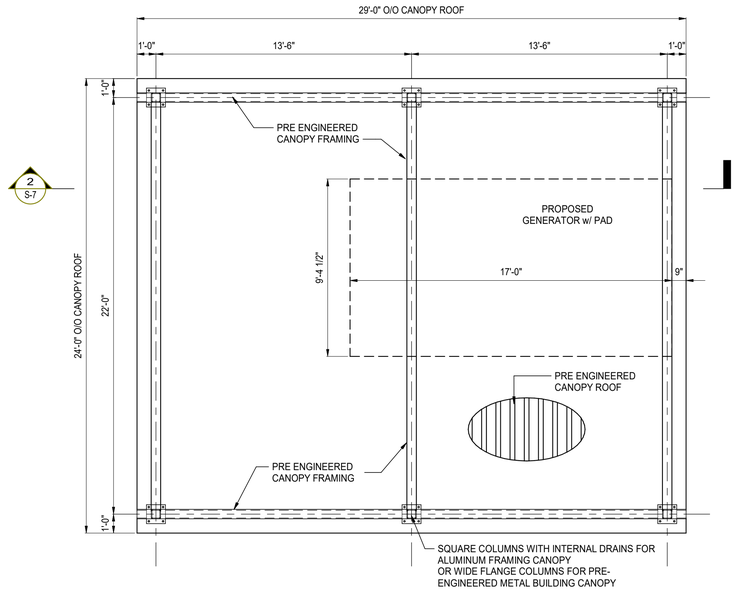
ALUMINUM OR PRE-ENGINEERED METAL BUILDING CANOPY:

1. DESIGN OF ALUMINUM CANOPY OR PRE-ENGINEERED METAL BUILDING CANOPY SHALL BE DELEGATED TO A REGISTERED DESIGN PROFESSIONAL ENGINEER IN THE STATE OF FLORIDA.
2. ALUMINUM CANOPY SHALL BE 6061-T6 ALUMINIUM OR PRE-ENGINEERED METAL BUILDING CANOPY SHALL BE HOT-DIPPED GALVANIZED STEEL.
3. CANOPY SHALL BE DESIGNED TO MEET THE LOADING REQUIREMENTS ON S-1 AND S-7.

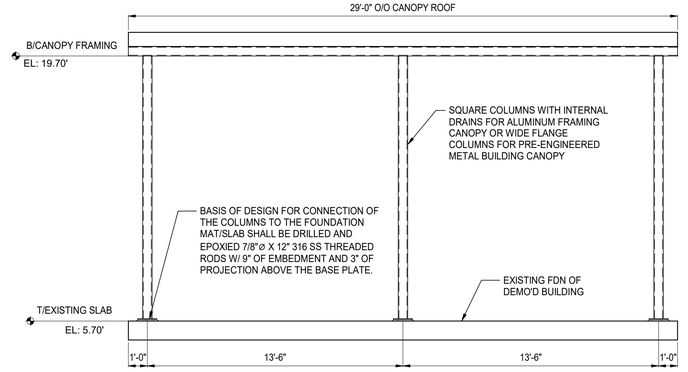


NOTE:
*FINAL GENERATOR PAD DIMENSIONS SHALL BE CONFIRMED AFTER APPROVAL OF THE GENERATOR SHOP DRAWINGS

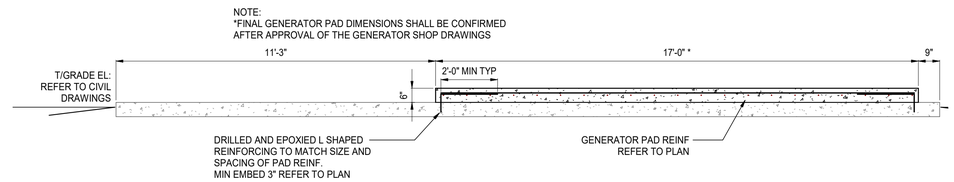
CANOPY PLAN
1/4" = 1'-0"



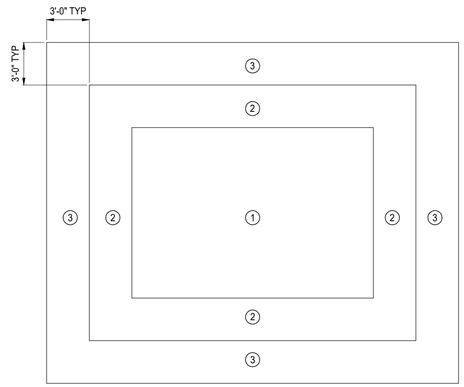
CANOPY FRAMING PLAN
1/4" = 1'-0"



2 S-7 CANOPY SECTION
1/4" = 1'-0"



1 S-7 GENERATOR PAD SECTION
3/8" = 1'-0"



PRE-ENGINEERED ALUM. CANOPY ROOF PRESSURES			
ZONE	EFFECTIVE AREA (SF)	PRESSURE (PSF)	
		POS (+)	NEG (-)
1	9	10.62	-25.44
	18	10.62	-25.44
	36	10.62	-25.44
2	9	16.98	-38.22
	18	16.98	-38.22
	36	10.62	-25.44
3	9	21.24	-76.38
	18	16.98	-38.22
	36	10.62	-25.44

NOTES:

1. COMPONENT AND CLADDING PRESSURES SHOWN ARE FOR ALLOWABLE STRESS DESIGN. NO FURTHER REDUCTIONS CAN BE TAKEN.

CANOPY ROOF UPLIFT PLAN

NO.	BY	DATE	SYMBOL	REVISIONS
6.				
5.				
4.				
3.				
2.				
1.				

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Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	C. LYNER
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DATE:	JUNE 2026
CHECKED BY:	C. MADDEN
DATE:	JUNE 2026

DESIGN ENGINEER
CHAD E. LYNER
FLORIDA REGISTRATION NO.
66277

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

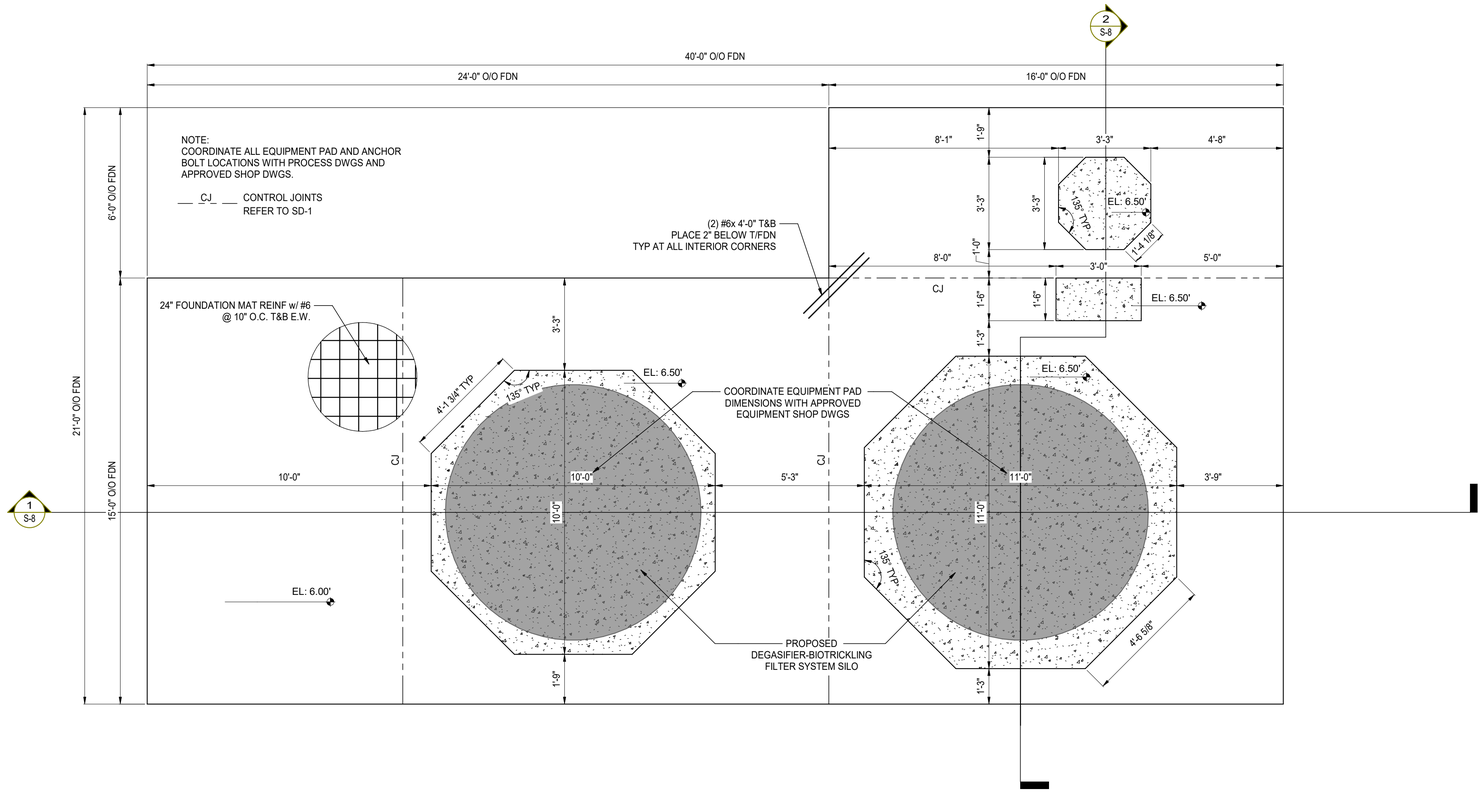
NORTH BEACH
WATER TREATMENT PLANT
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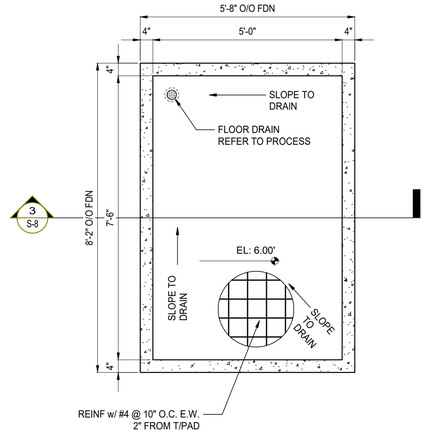
GENERATOR PAD AND CANOPY PLAN AND SECTIONS

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DWG NO. S-7
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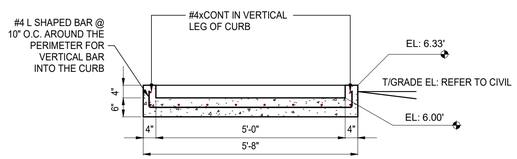
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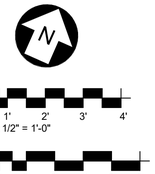




GST PUMP STATION CONTAINMENT PAD

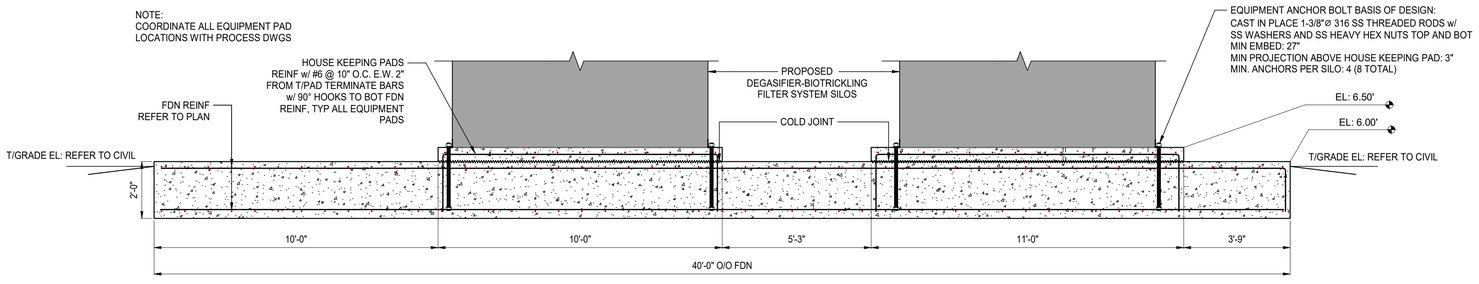
SCALE: 1/2" = 1'-0"





DEGASSIFIER / BIOTRICKLING FILTER SLAB PLAN

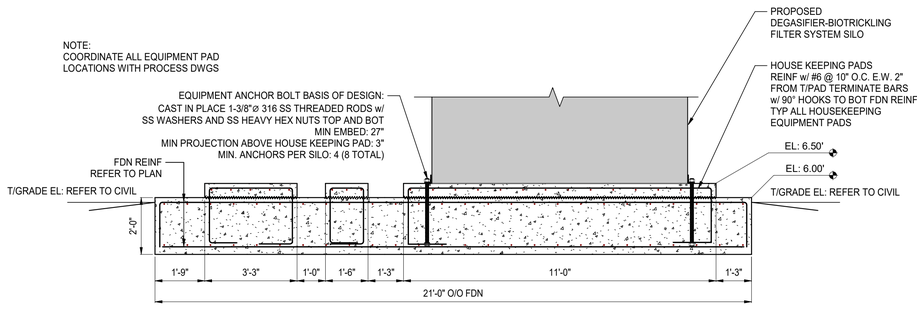
SCALE: 3/8" = 1'-0"



1 SECTION
– 3/8" = 1'-0"

3 SECTION

– 1/2" = 1'-0"



2 SECTION
– 3/8" = 1'-0"

NO.	BY	DATE	SYMBOL	REVISIONS
6.				
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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	C. LYNER
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FLORIDA REGISTRATION NO.
66277

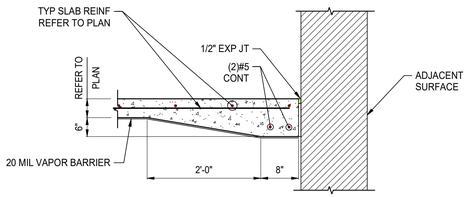
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1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

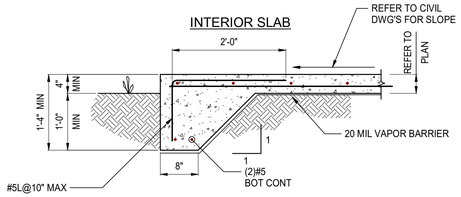
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

DEGASSIFIER / BIOTRICKLING FILTER SLAB PLAN AND SECTIONS (BID ALTERNATE)

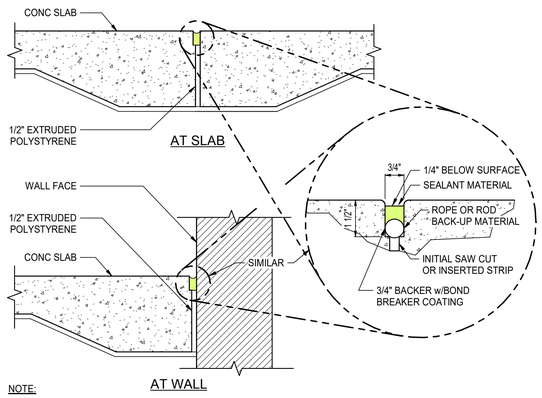
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A TURNDOWN AT SLAB EDGE
3/4" = 1'-0"



NOTE:

SEALANT MATERIAL SHALL BE A FIELD MOLDED SEALANT OF ONE OF THE FOLLOWING TYPES:

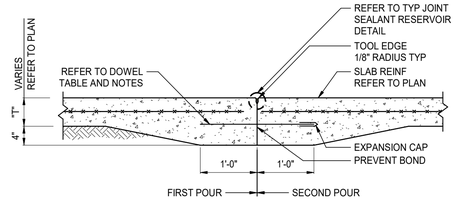
1. HOT APPLIED THERMOPLASTIC ASPHALT - RUBBER COMPOUNDS MEETING ASTM D1190.
2. HOT POURED ELASTOMERIC TYPE SEALANTS - MEETING ASTM D3406.
3. COLD APPLIED, MASTIC SINGLE OR MULTIPLE - COMPONENT SEALANTS MEETING ASTM D1850.

B TYPICAL SLAB 1/2" EXPANSION JOINT (EJ)
1 1/2" = 1'-0"

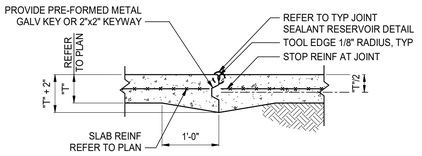
DOWEL TABLE			
"T" SLAB DEPTH (IN)	DIAMETER (IN)	TOTAL LENGTH (IN)	CENTER-TO -CENTER SPACING (IN)
5	5/8	12	12
6	3/4	14	12
7	7/8	14	12
8	1	14	12
9	1 1/8	16	12
10	1 1/4	18	12
11	1 3/8	18	12
12	1 1/2	20	12

DOWEL NOTES:

1. DOWELS SHALL BE PLAIN ROUND BARS EQUIVALENT TO ASTM A615 WITH A CORROSION RESISTANT COATING.
2. ONE-HALF (1/2) OF EACH BAR SHALL BE COVERED WITH ONE COAT TAR. PLACE EXPANSION CAP ON COATED SIDE.
3. DOWELS SHALL BE PLACED PARALLEL TO THE CENTERLINE AND SURFACE OF THE SLAB. TOLERANCE OF THE PLACEMENT SHALL BE ±1/4".



SLABS ≥ 5"

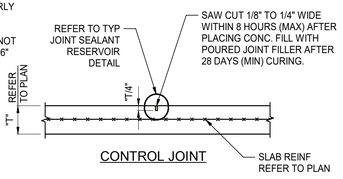


SLABS < 5"

C TYPICAL SLAB ON GRADE CONSTRUCTION JOINT
3/4" = 1'-0"

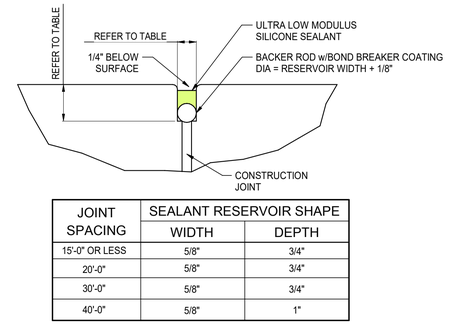
NOTES:

1. PLACE CONTROL JOINTS AT CHANGES IN SLAB WIDTH, AT COLUMN BLOCKOUTS, COLUMN CENTERLINES, & AT REGULARLY SPACED INTERVALS.
2. MAXIMUM SPACING OF JOINTS SHALL NOT EXCEED 8'-0" FOR 4" SLABS, 12'-0" FOR 6" SLABS, AND 16'-0" FOR 8" SLABS, IN EITHER DIRECTION.
3. DO NOT EXCEED A 2 TO 1 WIDTH TO LENGTH RATIO.
4. USE CONSTRUCTION JOINTS WHEN THERE IS A BREAK IN SLAB POURING OPERATIONS EXCEEDING 30 MINUTES.



CONTROL JOINT

D TYPICAL SLAB ON GRADE CONTROL JOINT (CJ)
3/4" = 1'-0"

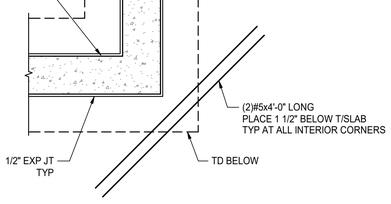


JOINT SPACING	SEALANT RESERVOIR SHAPE	
	WIDTH	DEPTH
15'-0" OR LESS	5/8"	3/4"
20'-0"	5/8"	3/4"
30'-0"	5/8"	3/4"
40'-0"	5/8"	1"

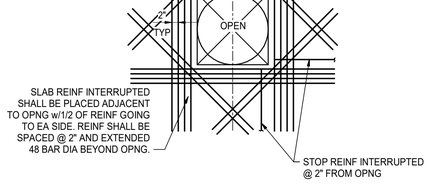
NOTE:

SEALANT MATERIAL SHALL BE A FIELD MOLDED SEALANT OF ONE OF THE FOLLOWING TYPES:
1. HOT APPLIED THERMOPLASTIC ASPHALT - RUBBER COMPOUNDS MEETING ASTM 1190.
2. HOT POURED ELASTOMERIC TYPE SEALANTS - MEETING ASTM D3406.
3. COLD APPLIED, MASTIC SINGLE OR MULTIPLE - COMPONENT SEALANTS METTING ASTM D1850.

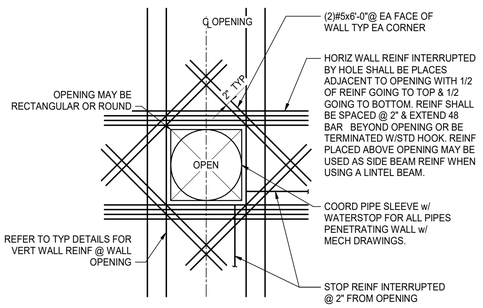
E TYPICAL JOINT SEALANT RESERVOIR
3/4" = 1'-0"



F ADDITIONAL SLAB REINF AT ALL RE-ENTRANT CORNERS
3/4" = 1'-0"



G ADDITIONAL REINF AT SLAB OPENING
1/2" = 1'-0"



H ADDITIONAL REINF AT OPENING IN CONCRETE WALL
1/2" = 1'-0"

NO.	BY	DATE	SYMBOL	REVISIONS
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MOTT MACDONALD
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Architects Engineers Surveyors
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NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

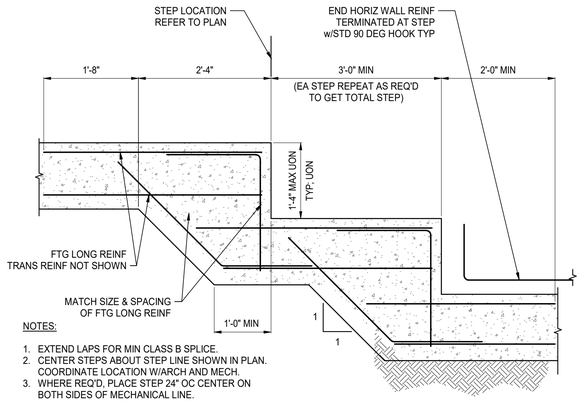
CONCRETE DETAILS

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DWG NO. SD-1
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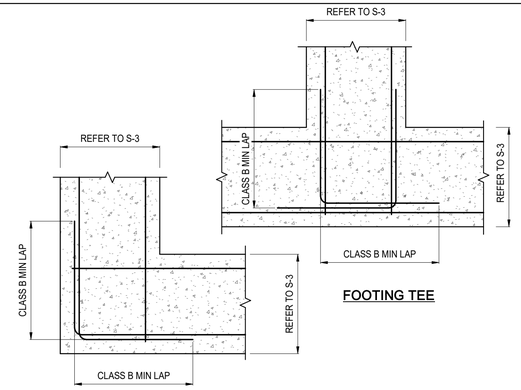


NOTES:

1. EXTEND LAPS FOR MIN CLASS B SPLICE.
2. CENTER STEPS ABOUT STEP LINE SHOWN IN PLAN. COORDINATE LOCATION W/ARCH AND MECH.
3. WHERE REQ'D, PLACE STEP 24" OC CENTER ON BOTH SIDES OF MECHANICAL LINE.

A TYPICAL FOOTING STEPS

3/4" = 1'-0"

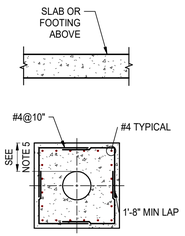


FOOTING TEE

FOOTING CORNER

B REINFORCING AT FOOTING TEES AND CORNERS

3/4" = 1'-0"

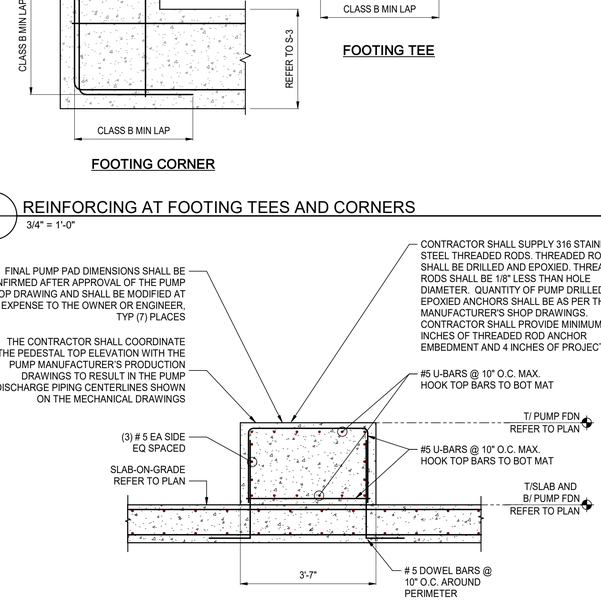


PIPE ENCASEMENT NOTES:

1. ALL PIPE SHALL BE PRESSURE TESTED BEFORE CONCRETE PLACEMENT.
2. ALL BELOW GRADE PIPES SHALL BE SUPPORTED ON CONCRETE BLOCKS PRIOR TO CASTING OF CONCRETE BEDDING. SIZE AND SPACING OF CONCRETE BLOCK SUPPORTS SHALL BE PER PIPE MANUFACTURER.
3. FOR ALL PIPES 12-INCH DIAMETER AND LARGER, ENCASEMENT SHALL BE CAST IN TWO POURS. INITIAL CAST SHALL BE CURED FOR 12 HOURS BEFORE CASTING THE SECOND POUR.
4. ENCASE ALL PIPES BELOW SLABS AND FOOTINGS. EXTEND ENCASEMENT 3'-0" BEYOND EDGE OF SLAB OR FOOTING.
5. ENCASEMENT FOR 6" DIAMETER AND SMALLER PIPES SHALL BE 6" MINIMUM. FOR PIPE DIAMETERS GREATER THAN 6", ENCASEMENT SHALL BE 12" MINIMUM.
6. MINIMUM BAR SPACING AROUND PERIMETER = 6" INCHES ON CENTER.

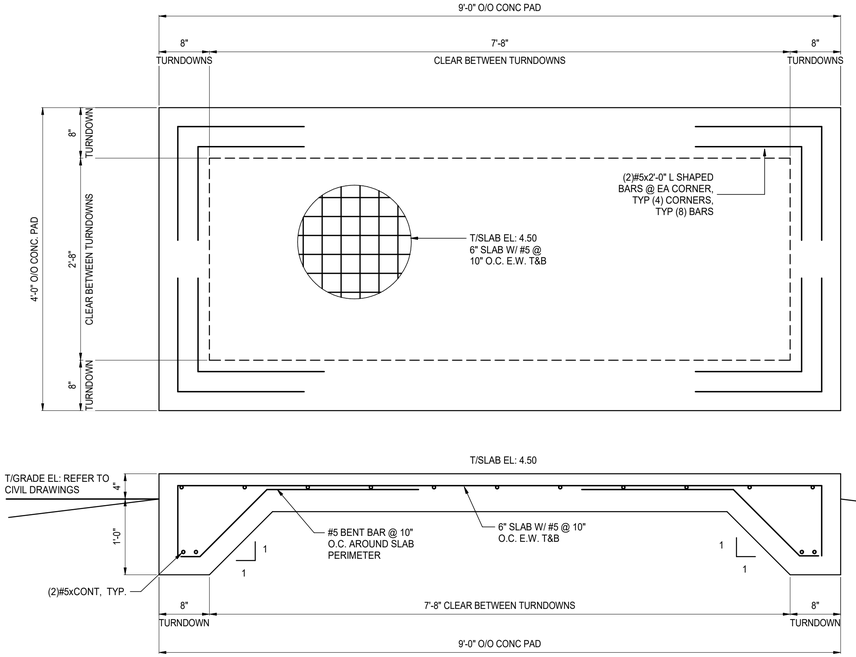
C CONCRETE PIPE ENCASEMENT

3/4" = 1'-0"



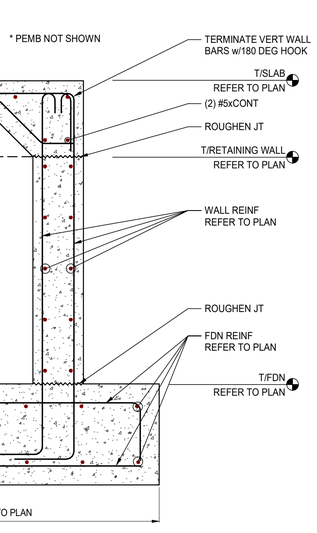
D SECTION @ PUMP FOUNDATION

1/2" = 1'-0"



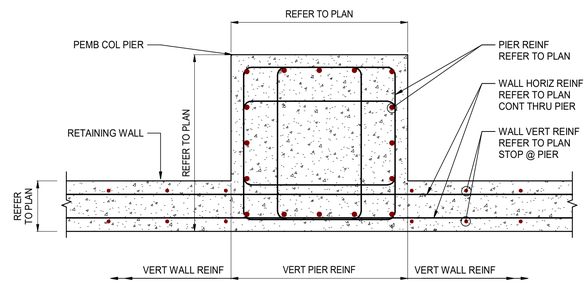
E MAGNETIC FLOW METER PAD

1" = 1'-0"

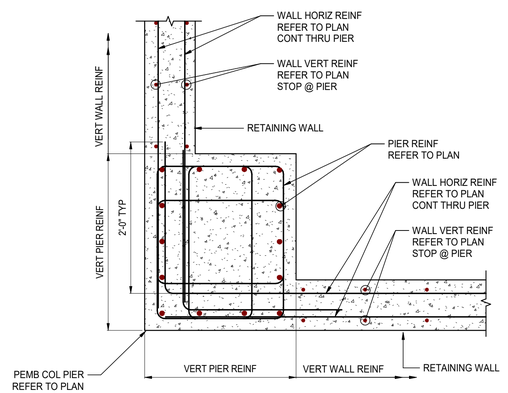


F SECTION AT RETAINING WALL

1" = 1'-0"



INTERMEDIATE PIERS



CORNER PIERS

G PIER-TO-RETAINING WALL REINFORCING

1" = 1'-0"

NO.	BY	DATE	SYMBOL	REVISIONS
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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	C. LYNER
DRAWN BY:	B. LEE
DATE:	JUNE 2026
CHECKED BY:	C. MADDEN
DATE:	JUNE 2026

DESIGN ENGINEER
CHAD E. LYNER
FLORIDA REGISTRATION NO.
66277

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

CONCRETE DETAILS

SHEET NO. 29
DWG NO. SD-2
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LIGHT GAGE FRAMING:

1. ALL LIGHT GAGE FRAMING SHALL BE GALVANIZED MINIMUM 50 KSI STEEL WITH THE FOLLOWING MINIMUM EFFECTIVE PROPERTIES OR APPROVED EQUIVALENT:

   A) 3 5/8" STUD WALL (TYPICAL WALLS UON)
   - STUD SPACING: 16" ON CENTER
   - STUD PROPERTIES: 3 5/8" 16ga, 1 5/8" MIN. LEG I_x=0.873 IN^4, S_x=0.444 IN^3
   - TRACK PROPERTIES: 3 5/8" 16ga, 1 1/4" MIN LEG I_x=0.678 IN^4, S_x=0.312 IN^3

   B) 8" STUD WALL (RESTROOM SIDE AND BACK WALLS):
   - STUD SPACING: 16" ON CENTER
   - STUD PROPERTIES: 8" 16ga, 1 5/8" MIN. LEG I_x=5.74 IN^4, S_x=1.43 IN^3
   - TOP & BOTTOM TRACKS: 8" 16ga, 1 1/4" MIN LEG I_x=5.22 IN^4, S_x=1.27 IN^3

   C) 10" LIGHT GAGE CEILING JOISTS FRAMING:
   - JOISTS SPACING: 16" ON CENTER
   - JOIST PROPERTIES: 10" 14ga, 3" MIN. LEG I_x=17.100 IN^4, S_x=2.800 IN^3
   - CEILING TRACKS AND BLOCKING: 10" 14ga, 1 1/4" MIN LEG I_x=10.200 IN^4, S_x=1.570 IN^3

   D) TYPICAL LIGHT GAGE STUD HEADER @ DOORWAYS IN LIGHT GAGE WALL FRAMING
   - BOTTOM HORIZONTAL CLOSURE TRACK: 3 5/8" 16ga, 1 1/4" MIN. LEG I_x=0.678 IN^4, S_x=0.312 IN^3
   - VERTICAL STUDS @ HEADER: (2) 3 5/8" 16ga, 1 5/8" MIN. LEG I_x=0.873 IN^4, S_x=0.444 IN^3
   - TOP HORIZONTAL CLOSURE TRACK: 3 5/8" 16ga, 1 1/4" MIN. LEG I_x=0.678 IN^4, S_x=0.312 IN^3
   - TRACKS-TO-STUDS CONNECTIONS SHALL BE (2) #10 SCREWS IN EACH TOP, BOTTOM, AND BOTH SIDES, SPACED ALONG THE HEADER AT 6" ON CENTER.

2. TRACK-TO-SLAB ATTACHMENTS:
   - BOTTOM WALL TRACKS: (2) 1/4" DIAMETER x 2 1/4" MAXI-SET SILVER ULTRASHIELD TAPCON AT 6" ON CENTER STAGGERED.
   - FASTENERS SHOULD NOT BE LOCATED LESS THAN 3" FROM EDGE OF CONCRETE.

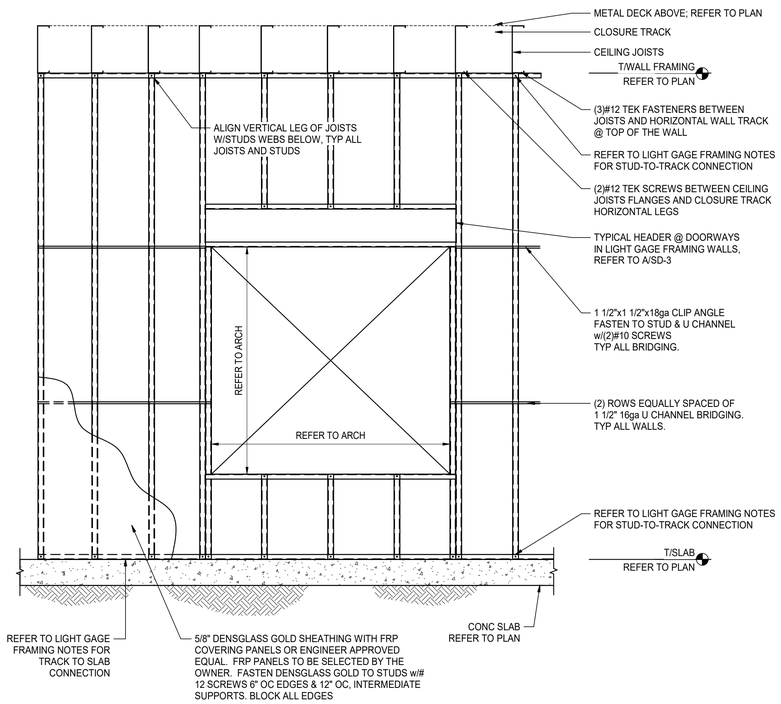
3. FASTEN ALL STUDS TO TOP AND BOTTOM TRACK WITH A MINIMUM OF (2) #12 SCREWS, (1) EACH FLANGE ON EACH SIDE, TYPICAL UNLESS OTHERWISE NOTED.

4. METAL STUDS SHALL HAVE A G90 GALVANIZE FINISH.

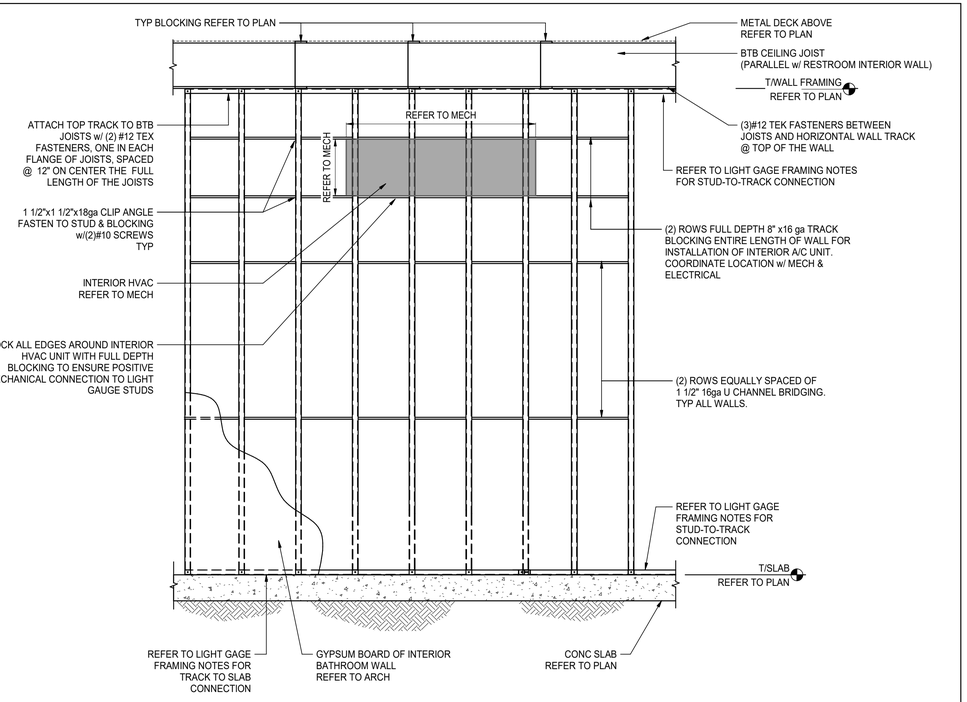
5. PLACE BLOCKING BEHIND ALL SHEATHING JOINTS.

6. ALL SCREWS SHALL BE BUILDEX TRAXX 5/16" HEX WASHER HEAD (HWH) OR EQUIVALENT, REFER TO PLANS AND DETAILS FOR FASTENER SIZE.

A – LIGHT GAUGE FRAMING NOTES
3/4" = 1'-0"



B – TYPICAL INTERIOR WALL FRAMING
3/4" = 1'-0"

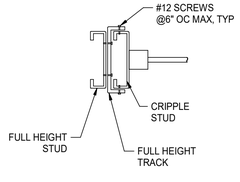


C – INTERIOR WALL FRAMING AT RESTROOM
3/4" = 1'-0"

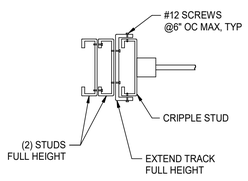
LIGHT GAGE JAMB SCHEDULE				
OPENING WIDTH	JAMB TYPE	TRACK SIZE	STUD SIZE	NOTES
OPENING ≤ 4'-0"	I	3 5/8" 16ga	3 5/8" 16ga	
OPENING ≤ 8'-0"	II	3 5/8" 16ga	3 5/8" 16ga	

NOTES:

1. REFER TO LIGHT GAGE FRAMING NOTES FOR STUD AND TRACK SIZES.
2. WINDOW AND DOOR ATTACHMENTS DESIGNED BY MANUFACTURER.

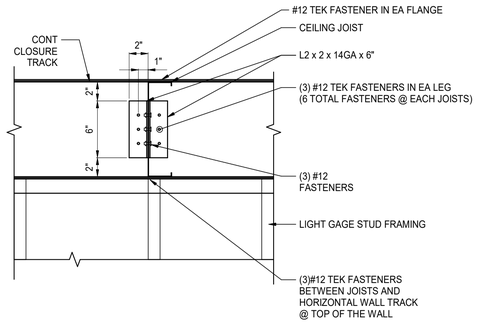


JAMB TYPE I

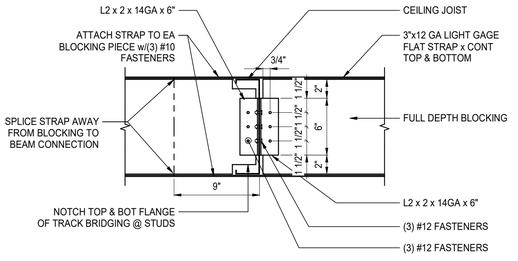


JAMB TYPE II

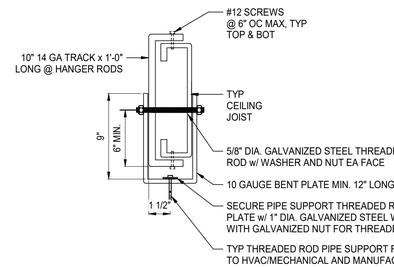
D – LIGHT GAGE JAMB SCHEDULE
3/4" = 1'-0"



E – TYPICAL CONNECTION OF STUD & TRACK TO WALL FRAMING
1 1/2" = 1'-0"



F – TYPICAL LIGHT GAUGE CEILING JOISTS BLOCKING DETAIL
1 1/2" = 1'-0"



G – TYPICAL PIPE SUPPORT TO LIGHT GAUGE JOIST FRAMING
1 1/2" = 1'-0"

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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	C. LYNER
DRAWN BY:	B. LEE
DATE:	JUNE 2026
CHECKED BY:	C. MADDEN
DATE:	JUNE 2026

DESIGN ENGINEER
CHAD E. LYNER
FLORIDA REGISTRATION NO.
66277

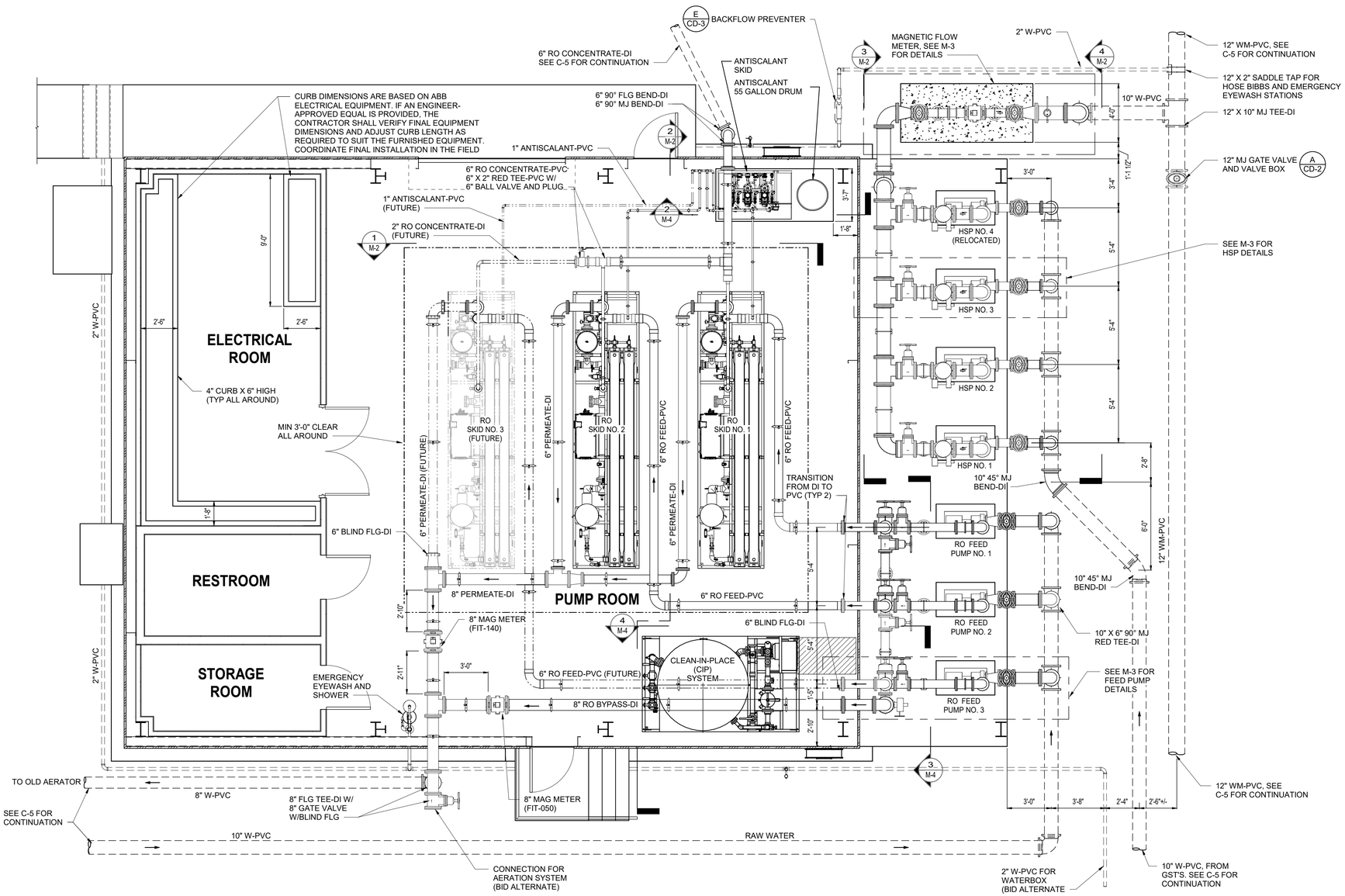
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NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

LIGHT GAGE FRAMING DETAILS

SHEET NO. 30
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FLOOR PLAN
1/4" = 1'-0"

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Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	S. ALIX
DRAWN BY:	B. LEE
DATE:	JUNE 2026
CHECKED BY:	S. ALIX
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DESIGN ENGINEER
CALE MADDEN, P.E.
FLORIDA REGISTRATION NO.
88379

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

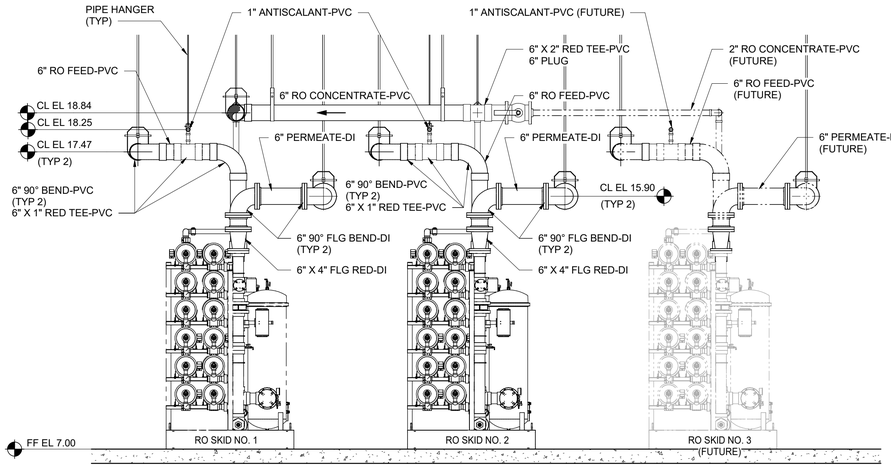
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

TREATMENT BUILDING FLOOR PLAN

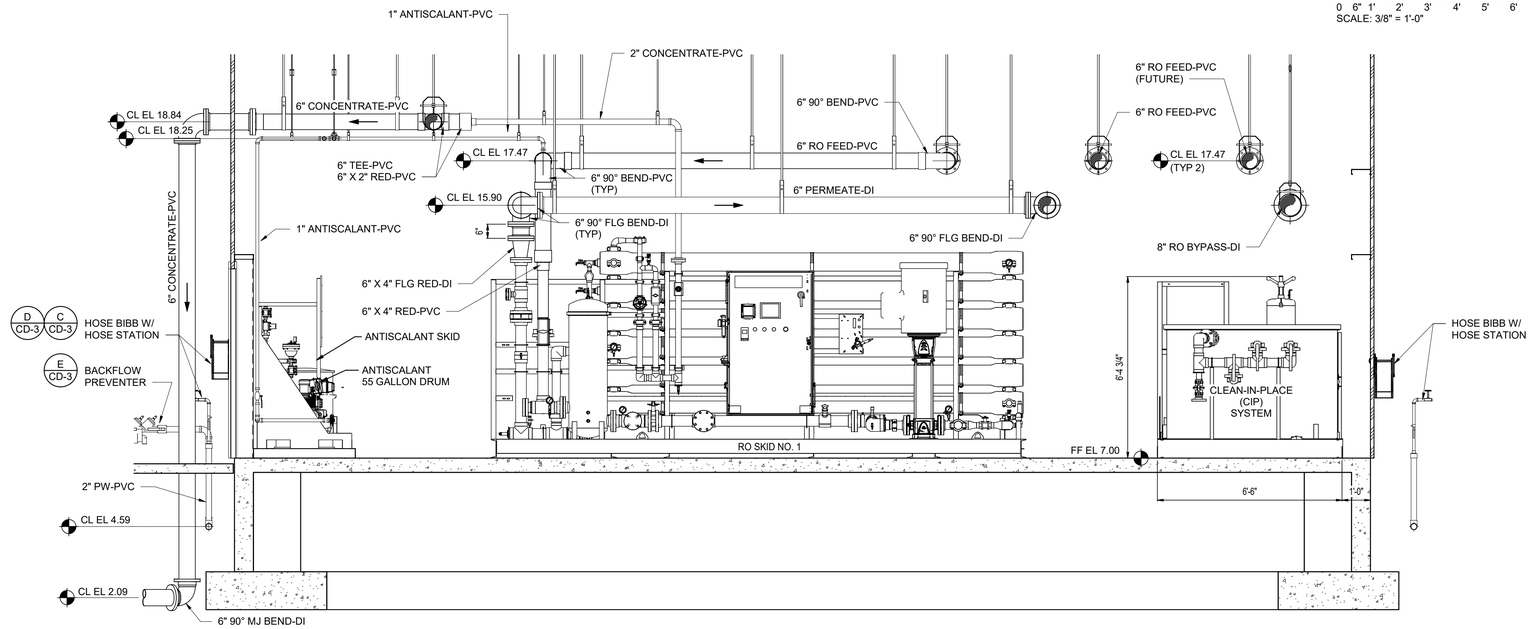
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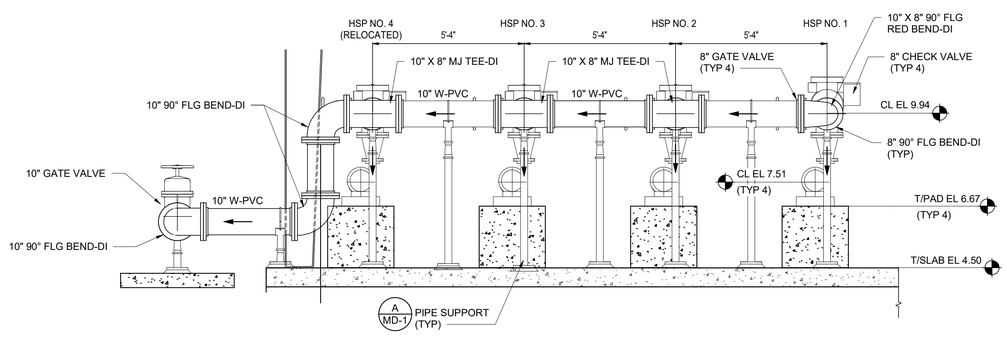
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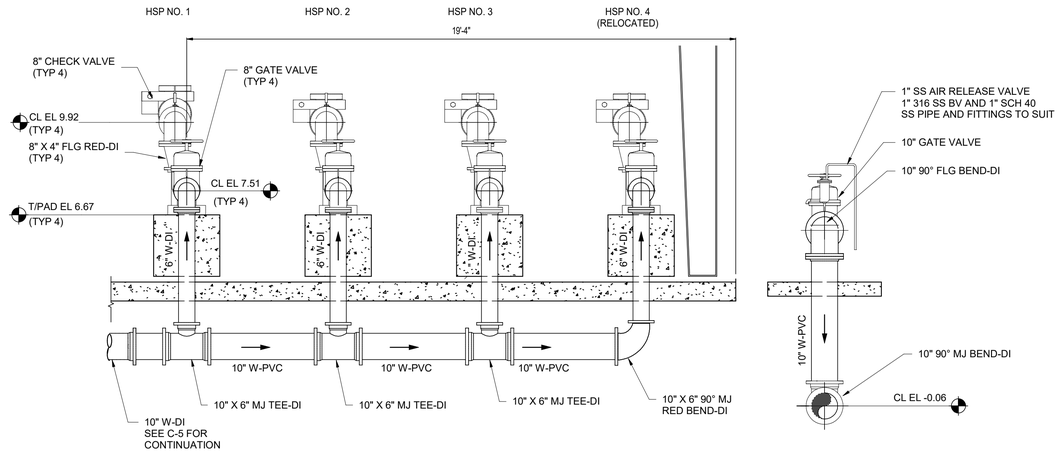
1 M-1 RO SKID SYSTEM SECTION
3/8" = 1'-0"



2 M-1 RO SKID SYSTEM SECTION
3/8" = 1'-0"



3 M-1 HSP SECTION
3/8" = 1'-0"



4 M-1 HSP SECTION
3/8" = 1'-0"

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Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	S. ALIX
DRAWN BY:	B. LEE
DATE:	JUNE 2026
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DESIGN ENGINEER
CALE MADDEN, P.E.
FLORIDA REGISTRATION NO.
88379

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

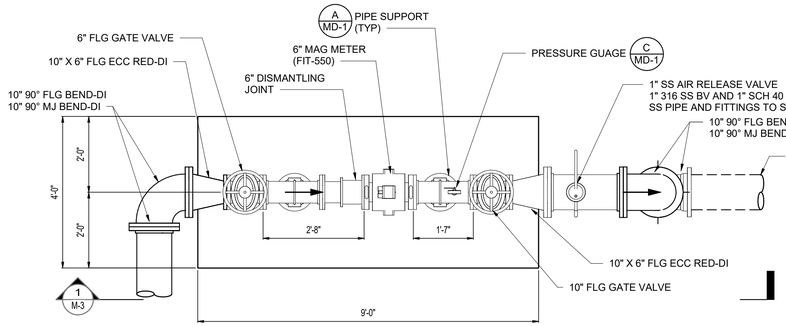
NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

TREATMENT BUILDING SECTIONS

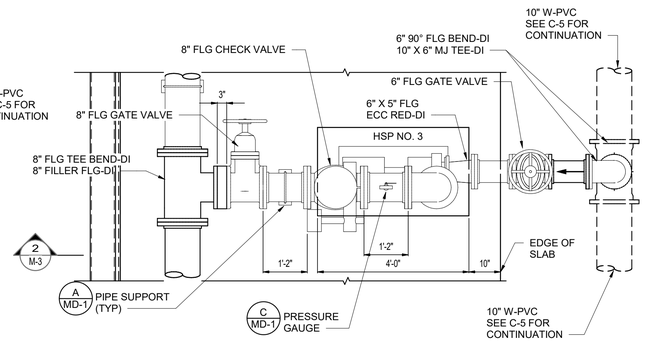
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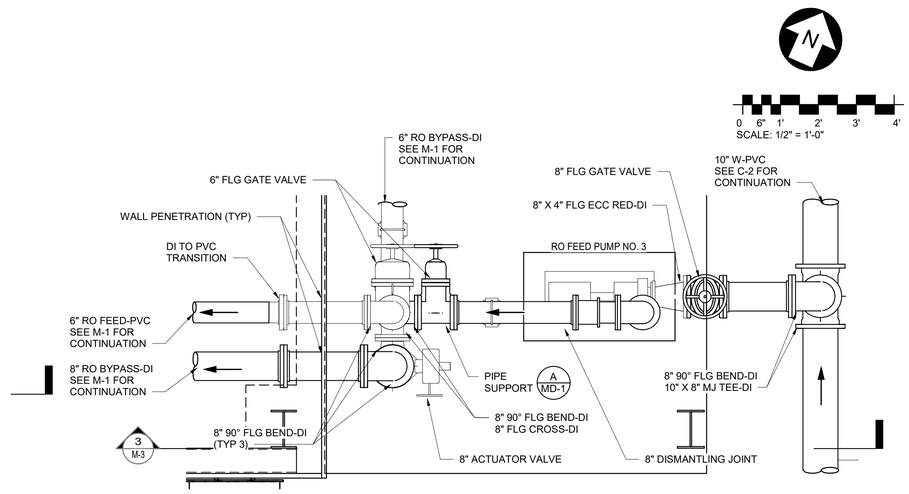
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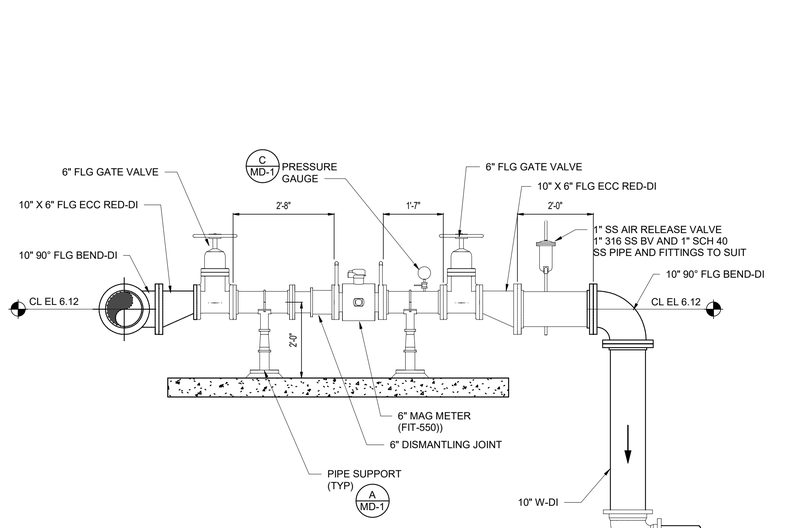
MAGNETIC FLOW METER PLAN
1/2" = 1'-0"



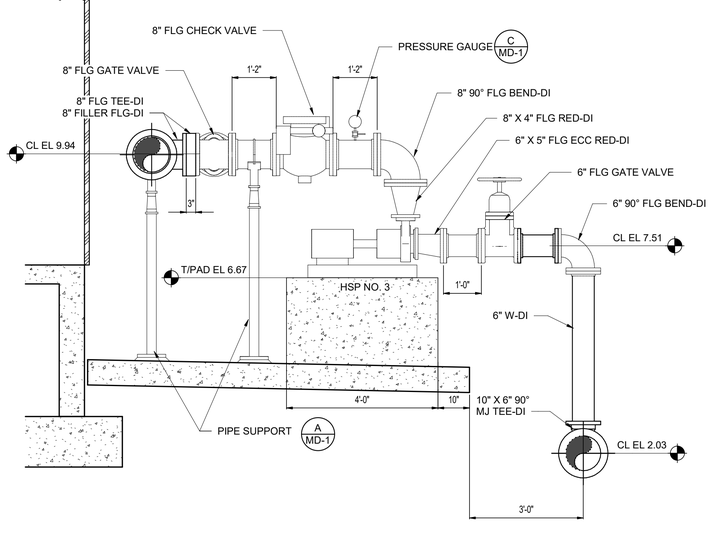
HIGH SERVICE PUMP PLAN
1/2" = 1'-0"



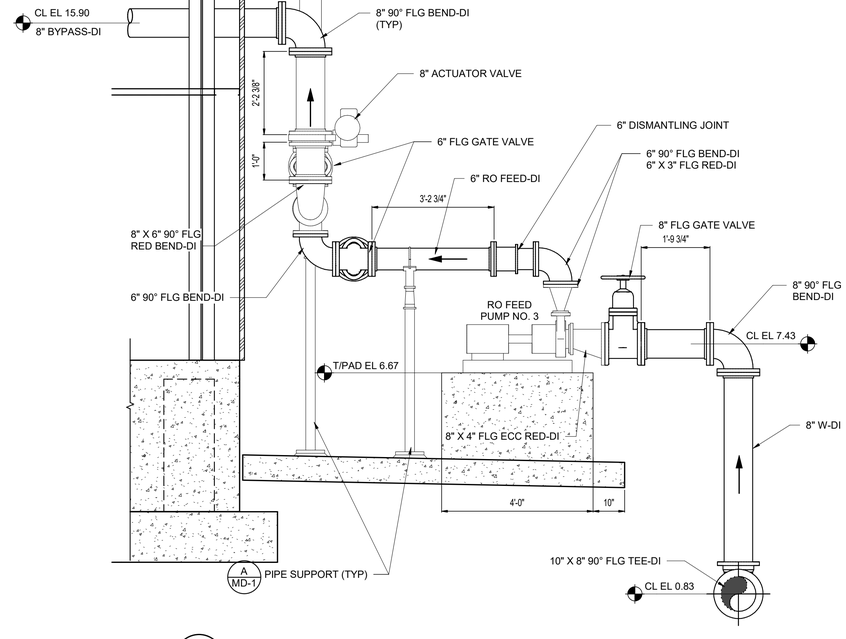
RO FEED PUMP PLAN
1/2" = 1'-0"



1 SECTION
1/2" = 1'-0"



2 SECTION
1/2" = 1'-0"



3 SECTION
1/2" = 1'-0"

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AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	S. ALIX
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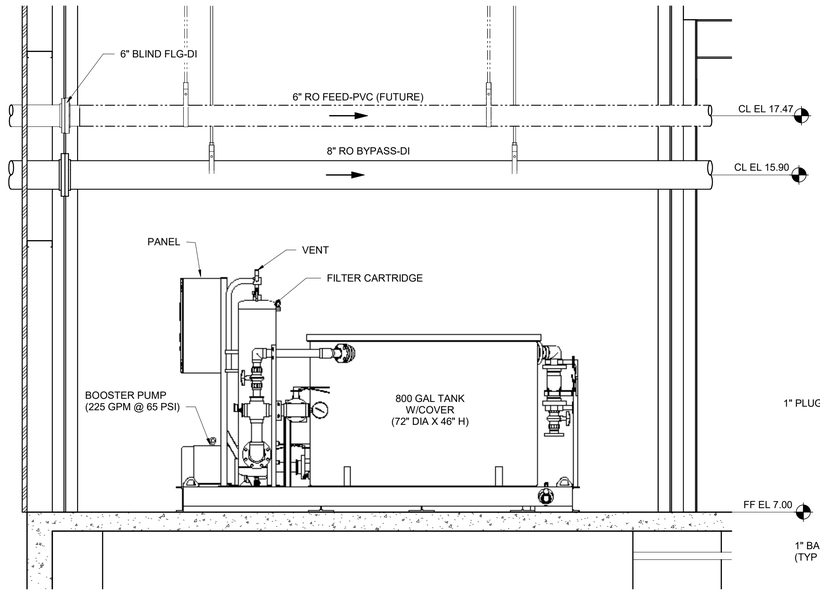
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PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

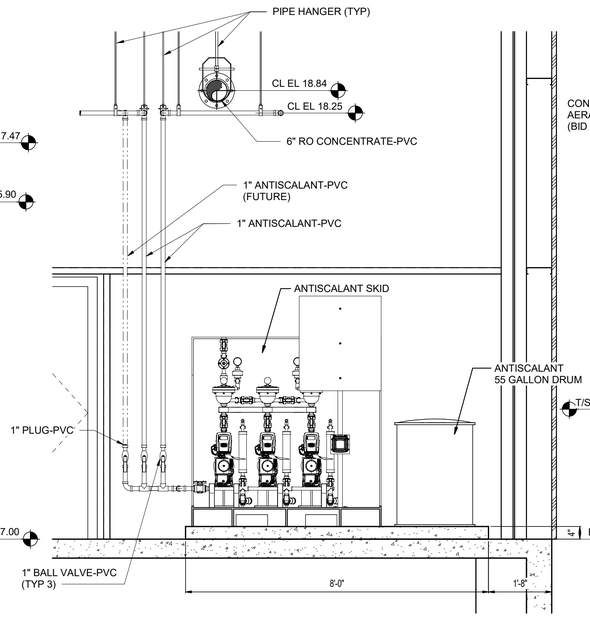
TREATMENT BUILDING SECTIONS

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DWG NO. M-3
100% SUBMITTAL

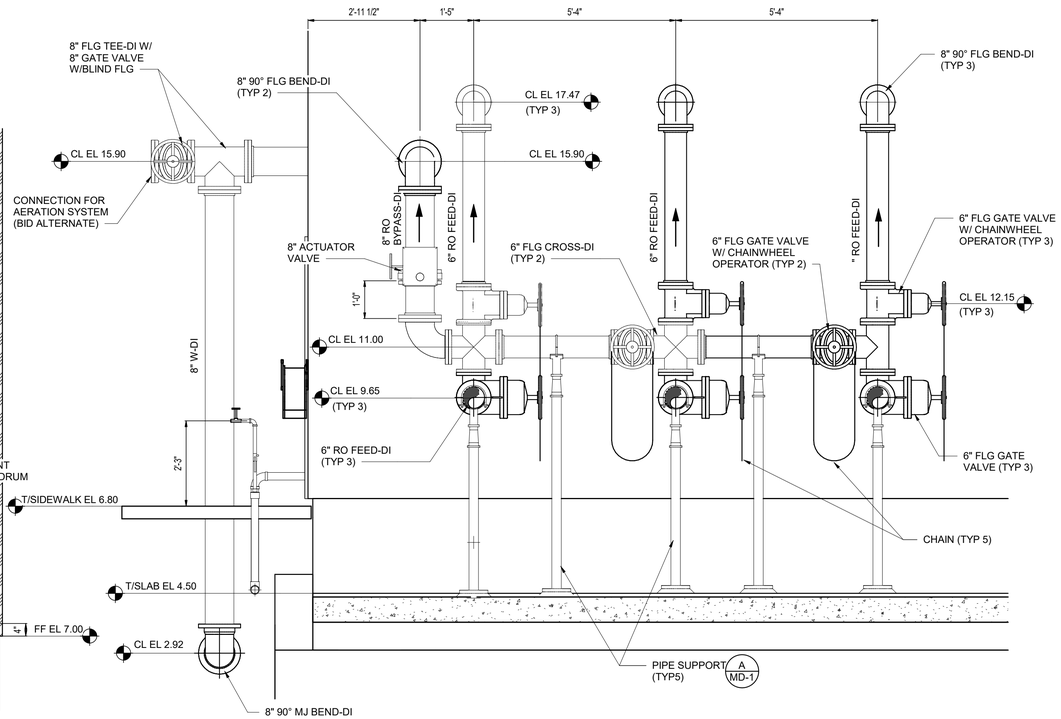
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4 M-1 CLEAN-IN-PLACE (CIP) SECTION
1/2" = 1'-0"



2 M-1 ANTISCALANT SYSTEM SECTION
1/2" = 1'-0"



3 M-1 RO SKID FEED AND BYPASS SECTION
1/2" = 1'-0"

NO.	BY	DATE	SYMBOL	REVISIONS
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AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	S. ALIX
DRAWN BY:	B. LEE
DATE:	JUNE 2026
CHECKED BY:	S. ALIX
DATE:	JUNE 2026

DESIGN ENGINEER
CALE MADDEN, P.E.
FLORIDA REGISTRATION NO.
88379

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

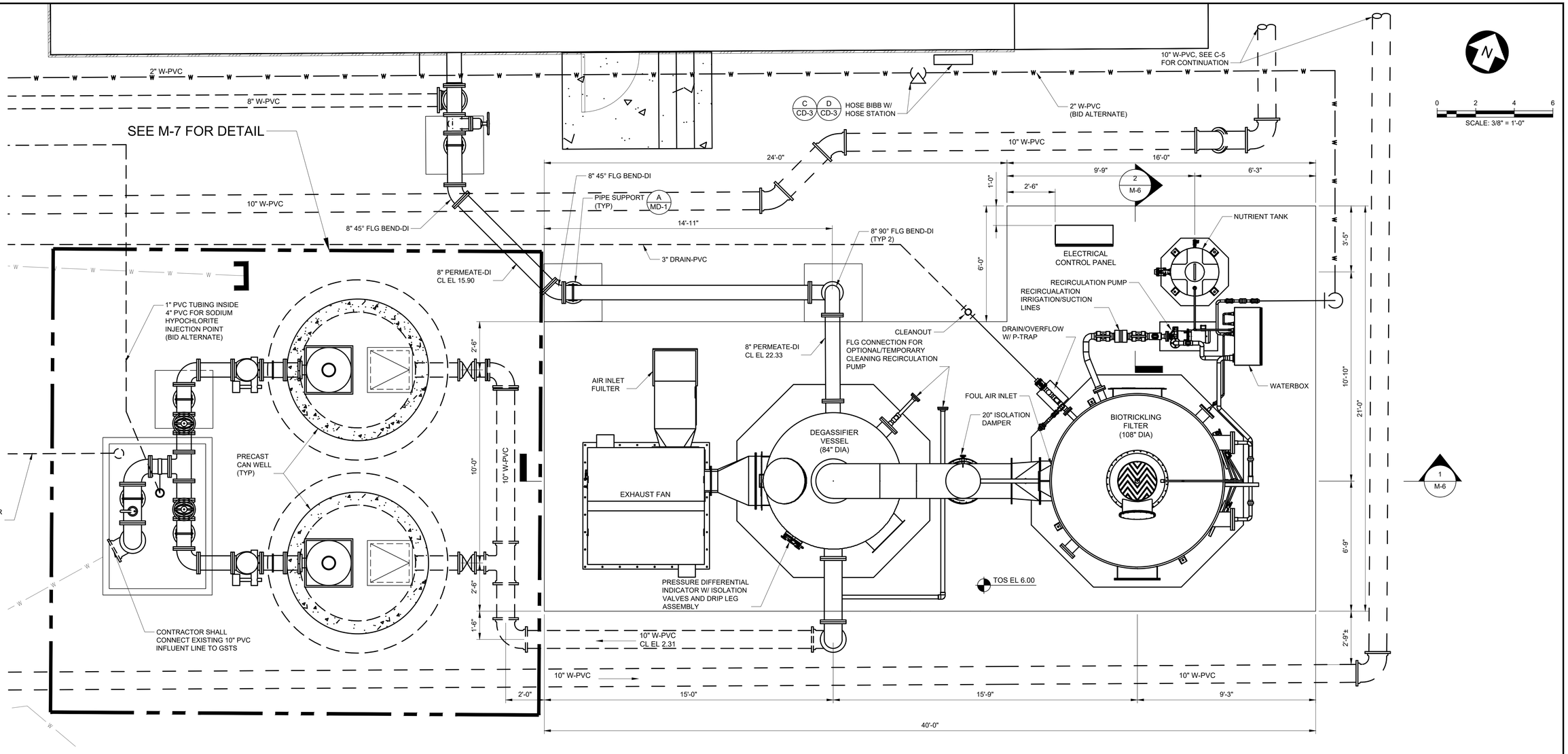
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

TREATMENT BUILDING SECTIONS

SHEET NO. 34
DWG NO. M-4
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NOTES:

1. DRAIN PIPING, NUTRIENT ASSEMBLY, AND INTERCONNECTED PIPING IS SHOWN CONCEPTUALLY. CONTRACTOR SHALL COORDINATE WITH MANUFACTURER OF DEGASSIFIER AND ODOR CONTROL SYSTEM FOR LOCATION OF BULK HEAD FITTINGS AND PROVIDE COORDINATED PIPE LAYOUT DRAWING FOR REVIEW AND APPROVAL.
2. RECIRCULATION ASSEMBLY AND DRAIN/OVERFLOW ASSEMBLY SHALL BE INSTALLED BY CONTRACTOR AND SUPPLIED BY MANUFACTURER. BOTH ASSEMBLIES SHALL BE INSTALLED ON ABOVE GRADE DRAIN PIPE FROM THE BIOTRICKLING FILTER.

NO.	BY	DATE	SYMBOL	REVISIONS
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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	S. ALIX
DRAWN BY:	B. LEE
DATE:	JUNE 2026
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1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

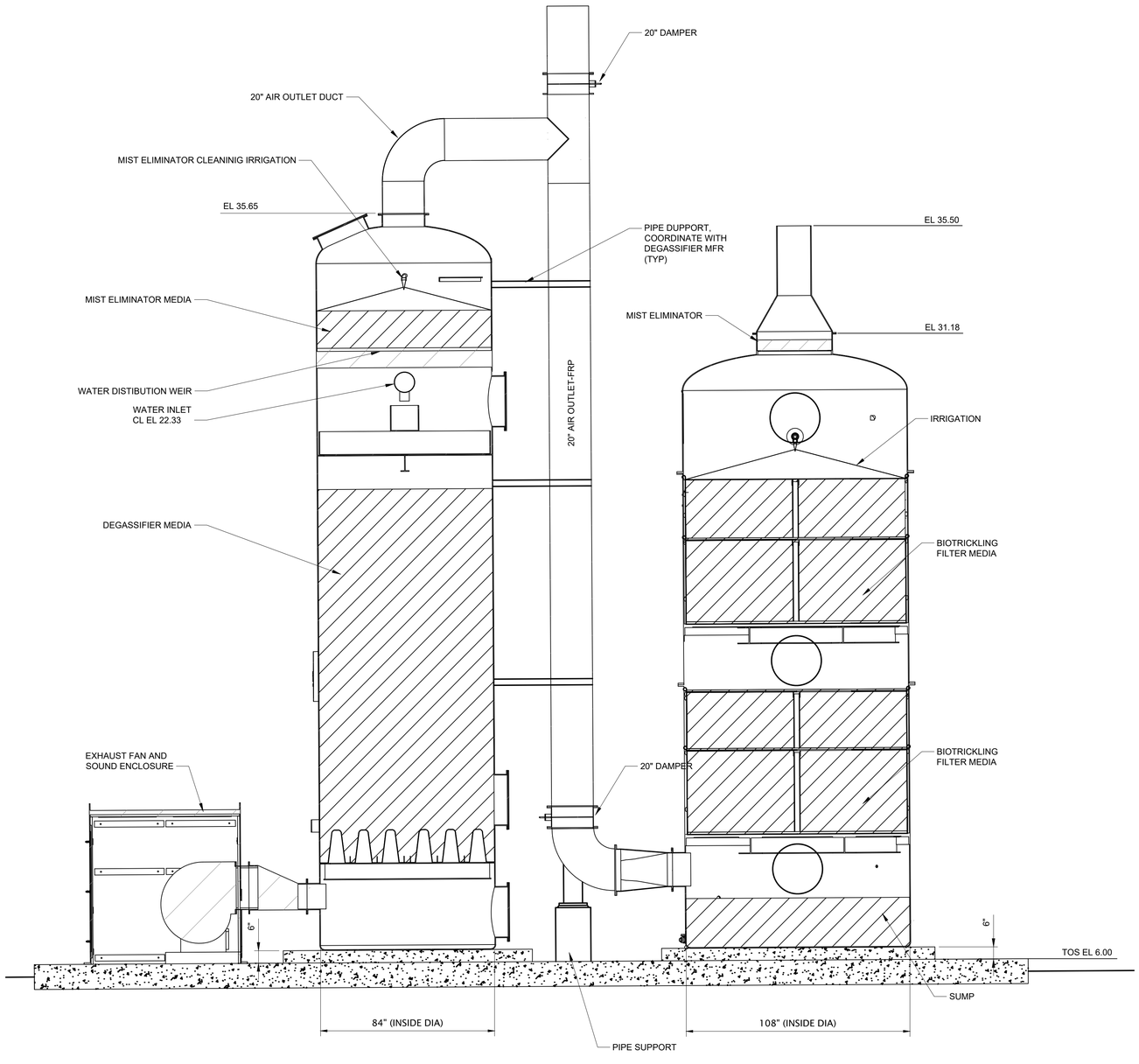
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

DEGASSIFIER / BIOTRICKLING FILTER PLAN (BID ALTERNATE)

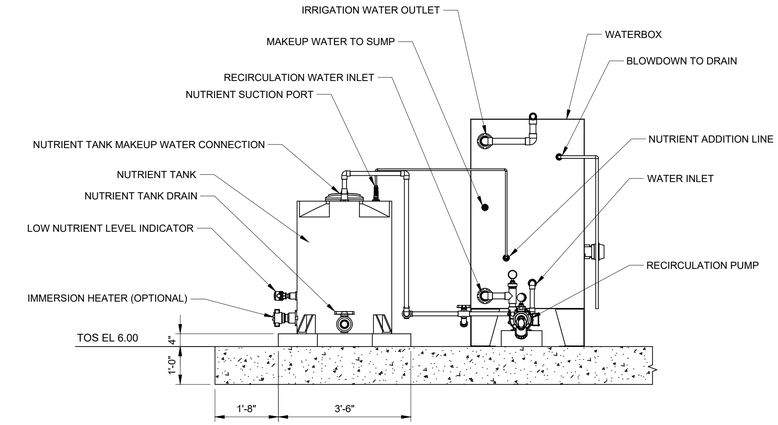
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Current Layout Tab = M-5 Wed Jun 03, 2026 - 08:55



1 M-5 SECTION
NTS



2 M-5 SECTION
NTS

0 2 4 6
SCALE: 3/8" = 1'-0"

0 1 2 4
SCALE: 1/2" = 1'-0"

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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	S. ALIX
DRAWN BY:	B. LEE
DATE:	JUNE 2026
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DESIGN ENGINEER
CALE MADDEN, P.E.
FLORIDA REGISTRATION NO.
88379

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

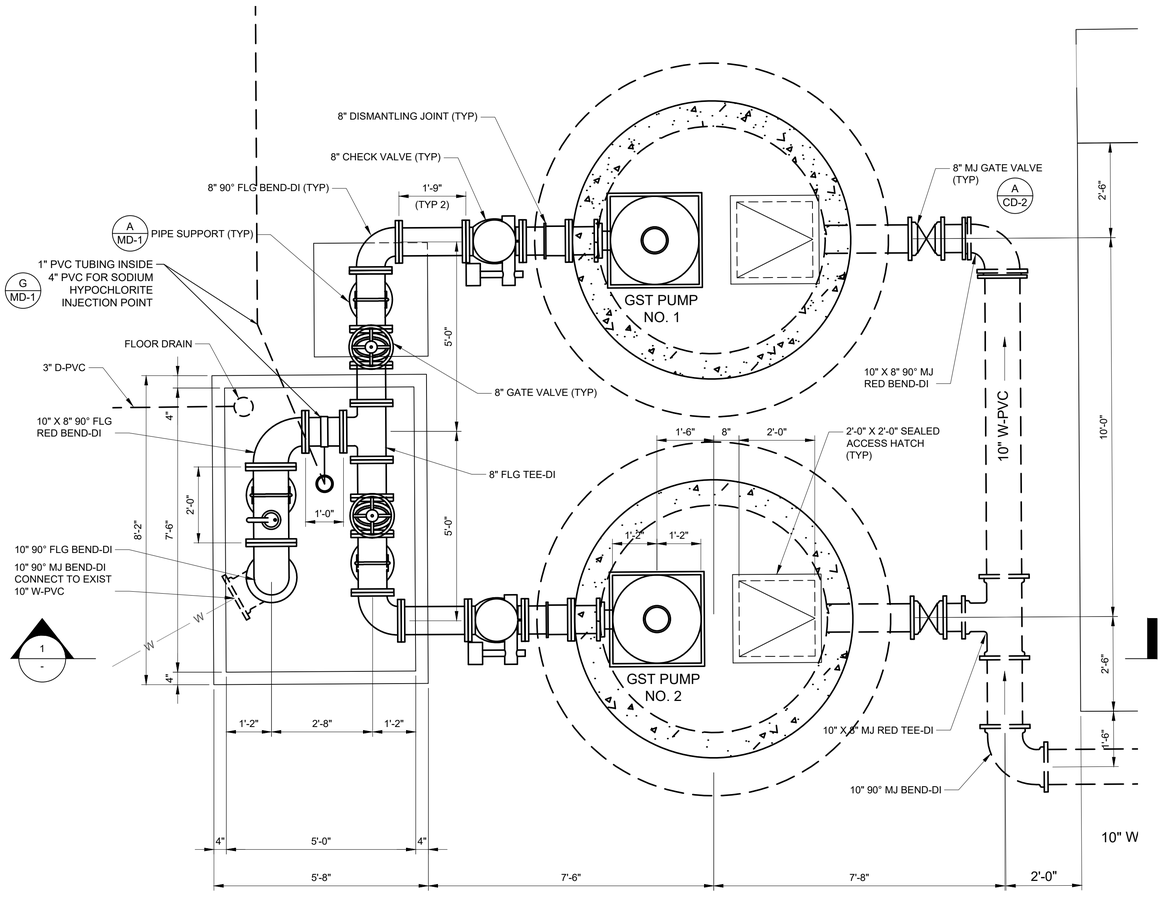
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

DEGASSIFIER / BIOTRICKLING
FILTER SECTIONS
(BID ALTERNATE)

SHEET NO. 36
DWG NO. M-6
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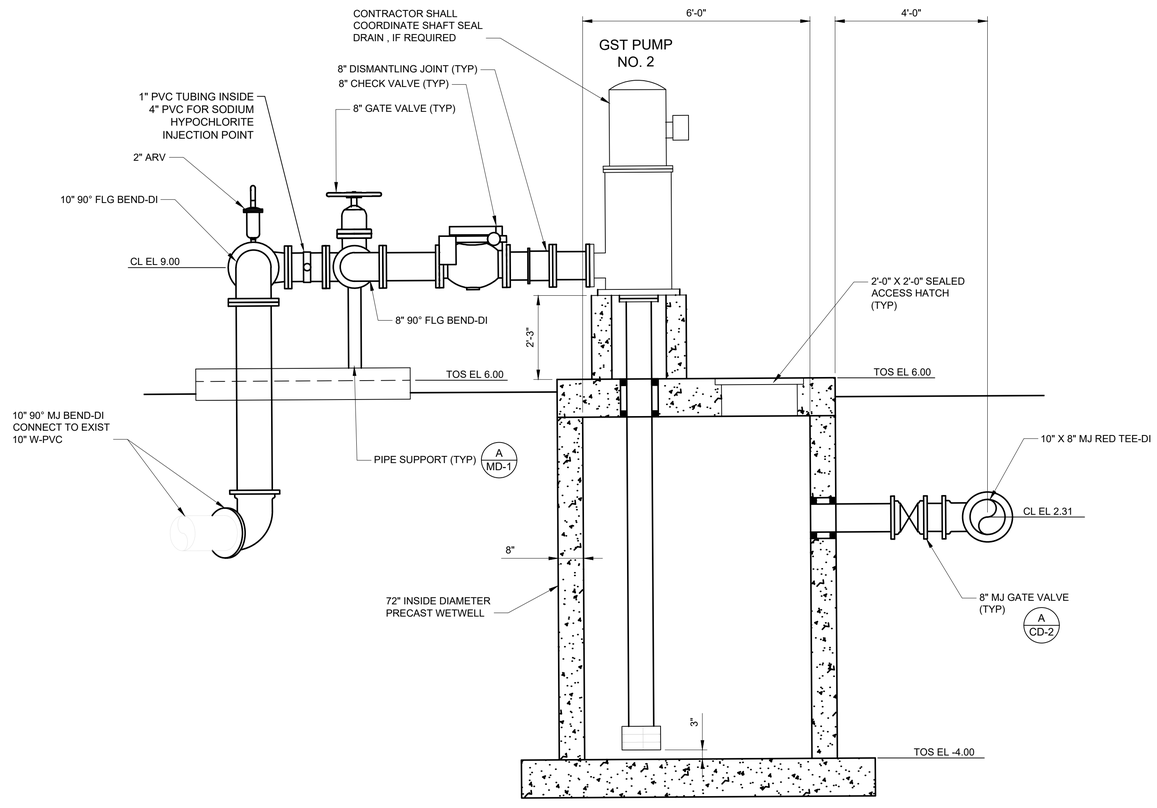
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GST PUMP STATION PLAN

SCALE: 1/2" = 1'-0"



1 - GST PUMP STATION SECTION

SCALE: 1/2" = 1'-0"

NOTES:

1. CONTRACTOR SHALL COORDINATE VIBRATION WITH BOTH THE PRECAST AND PUMP VENDORS TO ENSURE ADEQUATE DAMPENING.
2. CONTRACTOR SHALL ALSO COORDINATE WET WELL TOP SLAB FOR THRUST, LATERAL FORCES, AND BASE PLATE ANCHORING FOR THE SELECTED AND APPROVED PUMP DURING CONSTRUCTION.
3. CONTRACTOR SHALL COORDINATE PRECAST STRUCTURE ELEMENTS TO ENSURE THE ELEMENTS REMAIN FULLY ENGAGED AND SEALED DURING OPERATION.
4. CONTRACTOR SHALL INSTALL AND INTERNAL COATING THAT IS NSF 61 APPROVED AND AND EXTERNAL ASPHALTIC COATING TO ELIMINATE INTRUSION.
5. CONTRACTOR SHALL COORDINATE PIPE SEALS, OPENINGS AND COVER.

0 1 2 4
SCALE: 1/2" = 1'-0"

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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	S. ALIX
DRAWN BY:	B. LEE
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FLORIDA REGISTRATION NO.
88379

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

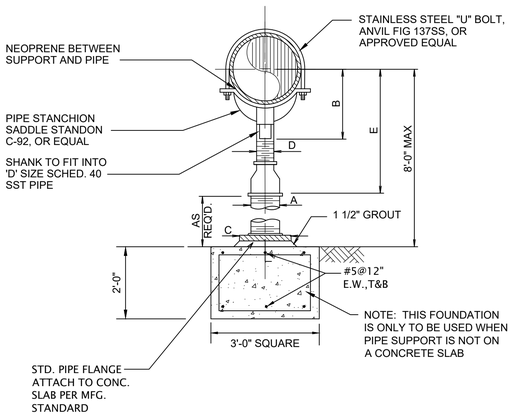
GST PUMP STATION
PLAN AND SECTION
(BID ALTERNATE)

SHEET NO. 37
DWG NO. M-7
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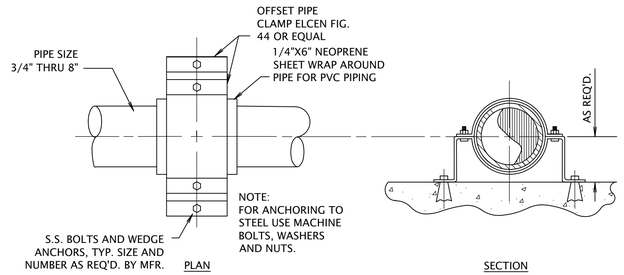
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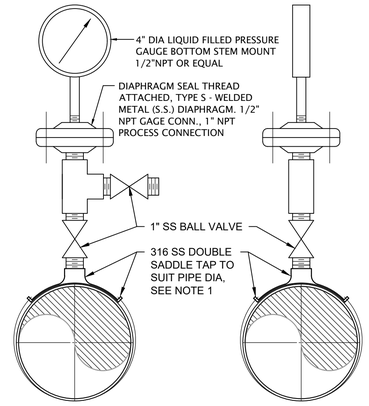
PIPE SIZE	A	B	C	D	E	
					MIN.	MAX.
2 1/2"	2 1/2"	3 1/2"	9"	1 1/2"	8"	13"
3"	2 1/2"	3 3/4"	9"	1 1/2"	8 1/4"	13 1/4"
3 1/2"	2 1/2"	4"	9"	1 1/2"	8 1/2"	13 1/2"
4"	3"	4 1/4"	9"	2 1/2"	9 1/4"	14"
5"	3"	4 7/8"	9"	2 1/2"	10"	14 3/4"
6"	3"	5 1/2"	9"	2 1/2"	10 1/2"	15 1/4"
8"	3"	6 7/8"	9"	2 1/2"	11 3/4"	16 1/2"
10"	3"	8 1/2"	9"	2 1/2"	13 1/2"	18 1/4"
12"	3"	9 15/16"	9"	2 1/2"	15"	19 3/4"
14"	4"	10 15/16"	11"	3"	16 1/4"	20 3/4"
16"	4"	12 3/8"	11"	3"	17 3/4"	22 1/4"
18"	6"	13 7/8"	13 1/2"	3 1/2"	19 1/2"	24"
20"	6"	15 3/8"	13 1/2"	3 1/2"	21"	25 1/2"
24"	6"	17 15/16"	13 1/2"	4"	23 3/4"	28 1/4"
30"	6"	21 5/16"	13 1/2"	4"	27"	31 1/2"
32"	6"	22 1/2"	13 1/2"	4"	28 1/4"	32 3/4"
36"	6"	24 1/2"	13 1/2"	4"	30 1/4"	34 3/4"



A 304 SS PIPE SUPPORT
- NTS

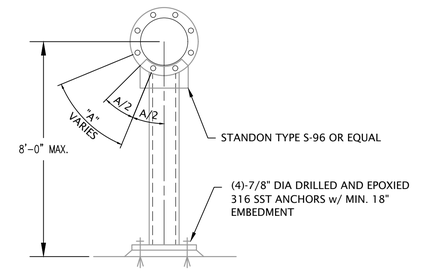


B 304 SS PIPE CLAMP
- NTS

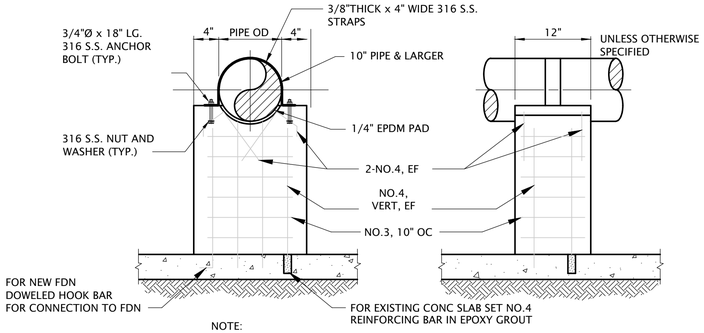


NOTE:
1. SADDLE TAPS SHALL BE USED ON DUCTILE IRON AND PVC PIPING. ALL PRESSURE GAUGE CONNECTIONS ON STAINLESS STEEL PIPING SHALL BE WELDED TAPS UNLESS OTHERWISE AGREED UPON WITH ENGINEER.

C PRESSURE GAUGE
- NTS

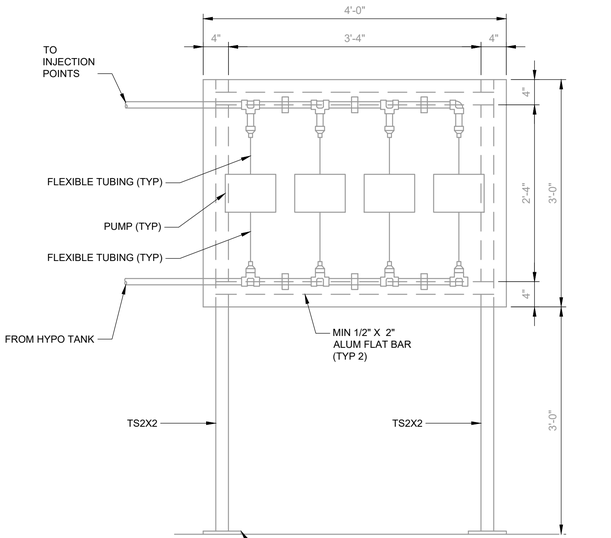


D 304 SS PIPE FLANGE CRADLE SUPPORT
- NTS

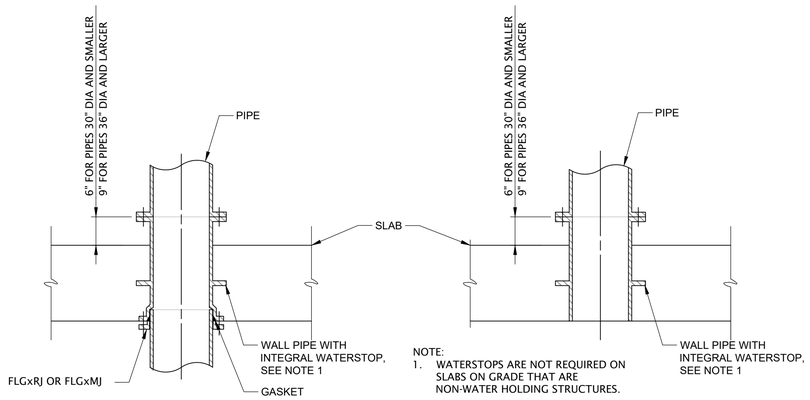


NOTE:
1. WHERE PIPE SUPPORT IS UNDER A PIPE APPURTENANCE THAT CANNOT ACCOMMODATE A STRAP, CONTRACTOR SHALL PROVIDE THE SUPPORT WITH NO STRAP.

F TYPICAL CONCRETE PIPE SUPPORT
- NTS



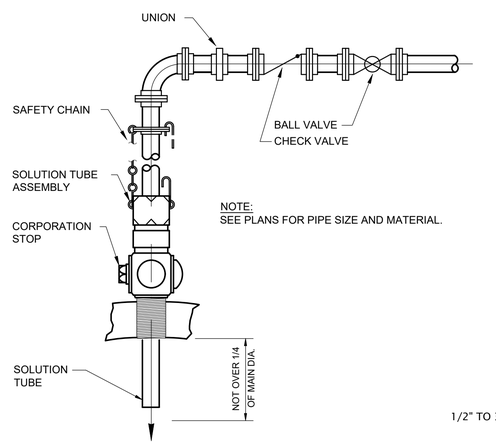
I SODIUM HYPOCHLORITE METERING PUMPS
- NTS



FLG X MJ THROUGH SLAB

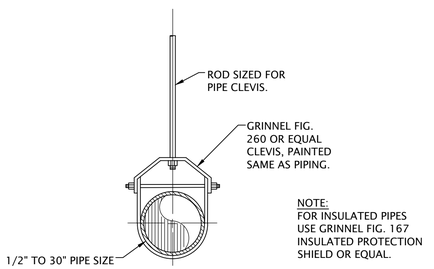
FLG X PE THROUGH SLAB

E SLAB PENETRATION
- NTS



NOTE:
SEE PLANS FOR PIPE SIZE AND MATERIAL.

G CHEMICAL INJECTION POINT
- NTS



NOTE:
FOR INSULATED PIPES USE GRINNEL FIG. 167 INSULATED PROTECTION SHIELD OR EQUAL.

H 304 SS PIPE SUPPORT
- NTS

NO.	BY	DATE	SYMBOL	REVISIONS
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MOTT MACDONALD
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Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

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DESIGN ENGINEER
CALE MADDEN, P.E.
FLORIDA REGISTRATION NO.
88379

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

MISCELLANEOUS MECHANICAL DETAILS

SHEET NO. 38
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HVAC LEGEND

	NEW WORK
BDD	BACK DRAFT DAMPER
M	MOTORIZED DAMPER
	MANUAL VOLUME DAMPER
	FIRE DAMPER WITH ACCESS DOOR
(CFM)	CEILING MOUNTED SUPPLY DIFFUSER, 360° AIR PATTERN, WITH NOTED AIR FLOW
RR CFM	CEILING MOUNTED RETURN OR EXHAUST REGISTER
RG CFM	CEILING MOUNTED RETURN OR EXHAUST GRILLE
	SUPPLY DUCT ELBOW WITH TURNING VANES (PLAN, UP, DOWN)
	RETURN OR EXHAUST DUCT ELBOW WITH TURNING VANES (PLAN, UP, DOWN)
U/D	DOOR UNDERCUT
T	WALL MOUNTED THERMOSTAT, MOUNT 5'-0" ABOVE FINISHED FLOOR

HVAC ABBREVIATIONS

AD	ACCESS DOOR
AFF	ABOVE FINISHED FLOOR
AMP	AMPERE
APD	AIR PRESSURE DROP
ARCH	ARCHITECTURAL
ASME	AMERICAN SOCIETY OF MECHANICAL ENGINEERS
B/D	BELT DRIVE
BDD	BACK DRAFT DAMPER
BHP	BREAK HORSEPOWER
BLDG.	BUILDING
BOT.	BOTTOM
BTU	BRITISH THERMAL UNIT
BTUH	BRITISH THERMAL UNITS PER HOUR
CD	CONDENSATE DRAIN
CFM	CUBIC FEET PER MINUTE
CO	CARBON MONOXIDE
CONT.	CONTINUATION
CP	CONDENSATE PUMP
CR	CEILING REGISTER
CU	CONDENSING UNIT
CU. FT.	CUBIC FEET
DB	DRY BULB
dBA	DECIBELS
DD	DIRECT DRIVE
DDC	DIRECT DIGITAL CONTROLS
DIA	DIAMETER
DN	DOWN
DWG	DRAWING
EA	EACH
EAT	ENTERING AIR TEMPERATURE
EF	EXHAUST FAN
EL	ELEVATION
ELEC.	ELECTRICAL
ER	EXHAUST REGISTER
ESP	EXTERNAL STATIC PRESSURE
EUH	ELECTRIC UNIT HEATER
EXH.	EXHAUST
°F	DEGREE, FAHRENHEIT
FLA	FULL LOAD AMPERES
FPM	FEET PER MINUTE
FT	FEET
FT. WG.	FEET OF WATER COLUMN GAUGE
GUH	GAS UNIT HEATER
H	HEIGHT
HP	HORSEPOWER
HR	HOURS
HZ	HERTZ
IN.	INCHES
IN. WG.	INCHES OF WATER COLUMN GAUGE
kW	KILOWATT
L	LENGTH
LAT	LEAVING AIR TEMPERATURE
LBS	POUNDS
LV	LOUVER
MAX	MAXIMUM
MBH	THOUSAND BTU PER HOUR
MCA	MINIMUM CIRCUIT AMPERES
MD	MOTORIZED DAMPER
MECH.	MECHANICAL
MIN	MINIMUM
MOCP	MAXIMUM OVERCURRENT PROTECTION
NFA	NET FREE AREA
NTS	NOT TO SCALE
OA	OUTSIDE AIR
OAI	OUTSIDE AIR INTAKE
PD	PRESSURE DROP
PH	PHASE
QTY	QUANTITY
RA	RETURN AIR
RF	RETURN FAN
REF	REFRIGERANT
RG	RETURN GRILLE
RLA	RUNNING LOAD AMPERES
RM	ROOM
RPM	REVOLUTIONS PER MINUTE
RR	RETURN REGISTER
SA	SUPPLY AIR
SEER	SEASONAL ENERGY EFFICIENCY RATIO
SENS.	SENSIBLE
SF	SUPPLY FAN
SMACNA	SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION
SQ	SQUARE
SQ. FT.	SQUARE FEET
SP	STATIC PRESSURE
SR	SUPPLY REGISTER
TA	TRANSFER AIR
TSP	TOTAL STATIC PRESSURE
TYP	TYPICAL
UH	UNIT HEATER
V	VOLT
VD	VOLUME DAMPER
VENT.	VENTILATION
VFD	VARIABLE FREQUENCY DRIVE
W	WIDTH
W/	WITH
WB	WET BULB
W.C.	WATER COLUMN
WG	WATER GAUGE
WMS	WIRE MESH SCREEN

GENERAL NOTES

1. DUE TO THE SMALL SCALE OF THE DRAWINGS THE DUCTWORK AND PIPING SHOWN ARE DIAGRAMMATIC. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY OFFSETS TO AVOID CONFLICTS WITH STRUCTURAL ELEMENTS, LIGHTING FIXTURES, PLUMBING AND SPRINKLER PIPING.
2. DUE TO TIGHT SPACE CONDITIONS, COORDINATION OF DUCT, PIPE, CONDUITS AND STRUCTURAL MEMBER LOCATIONS IS CRITICAL. GENERAL CONTRACTOR SHALL PREPARE COORDINATION DRAWINGS TO BE SIGNED BY ALL TRADES. COORDINATION DRAWINGS SHOULD INCLUDE ALL DUCTWORK, PIPING, LIGHTING FIXTURES, ETC. OBTAIN ENGINEER'S APPROVAL PRIOR TO DUCTWORK AND PIPING INSTALLATION.
3. PRIOR TO ORDERING OR FABRICATING ANY NEW EQUIPMENT, THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CLEARANCES. EQUIPMENT LOCATIONS AND CONNECTION SIZES SHALL BE DERIVED FROM THE MANUFACTURER'S CERTIFIED DRAWINGS FOR THE SPECIFIC EQUIPMENT THAT WILL ACTUALLY BE FURNISHED AND INSTALLED FOR THIS PROJECT. ANY DISCREPANCIES BETWEEN THE DRAWINGS AND THE ACTUAL FIELD CONDITIONS SHALL BE BROUGHT TO THE ENGINEER'S ATTENTION IMMEDIATELY.
4. THE DETAILS INDICATED ON THE DRAWINGS AS TYPICAL SHALL APPLY TO ALL SIMILAR CONDITIONS UNLESS NOTED SPECIFICALLY OTHERWISE.
5. PROVIDE ALL NECESSARY DUCT TRANSITIONS FROM THE INDICATED DUCT SIZE TO THE ACTUAL EQUIPMENT DUCT COLLAR SIZE.
6. ALL DUCT ELBOWS SHALL BE EITHER VANED OR LONG RADIUS ELBOWS.
7. PROVIDE FLEXIBLE CONNECTIONS AT ALL DUCT CONNECTIONS TO EQUIPMENT.
8. PROVIDE ADJUSTABLE AIR VOLUME DAMPERS AT ALL DUCT BRANCHES, AND IN THE DUCTS TO CEILING DIFFUSERS, SUPPLY, AND RETURN/EXHAUST REGISTERS.
9. ALL SPACE TEMPERATURE SENSORS (THERMOSTATS) SHALL BE MOUNTED AT 5'-0" ABOVE FINISHED FLOOR UNLESS NOTED OTHERWISE.
10. WHEN PIPES, DUCTS AND OTHER HANGING ITEMS ARE SUPPORTED FROM THE STRUCTURAL ELEMENTS, THE CONTRACTOR SHALL PROVIDE THE MISCELLANEOUS STEEL NECESSARY TO SUPPORT PIPING, DUCTWORK AND MECHANICAL EQUIPMENT.
11. SHOULD DISCREPANCIES OCCUR BETWEEN CONTRACT DRAWINGS AND CONTRACT SPECIFICATIONS, THE MORE STRINGENT REQUIREMENTS IN CONJUNCTION WITH APPLICABLE LOCAL CODES, STANDARDS, RULES, LAWS, ETC. SHALL APPLY.
12. ALL FIRE DAMPERS WITH DUCTWORK CONNECTED TO EACH SIDE SHALL BE PROVIDED WITH A ACCESS DOOR MOUNTED IN THE DUCT. THE ACCESS DOOR SHALL BE OF THE INSULATION TYPE WHEN THE RESPECTIVE DUCT IS INSULATED.
13. PROVIDE ACCESS DOORS IN THE HARD CEILING AT ALL FIRE DAMPERS, VOLUME DAMPERS AND VALVES.

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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	C. MARTINEZ
DRAWN BY:	C. MARTINEZ
DATE:	JUNE 2026
CHECKED BY:	J. WANG
DATE:	JUNE 2026

DESIGN ENGINEER
JACK C. WANG
FLORIDA REGISTRATION NO.
81017

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

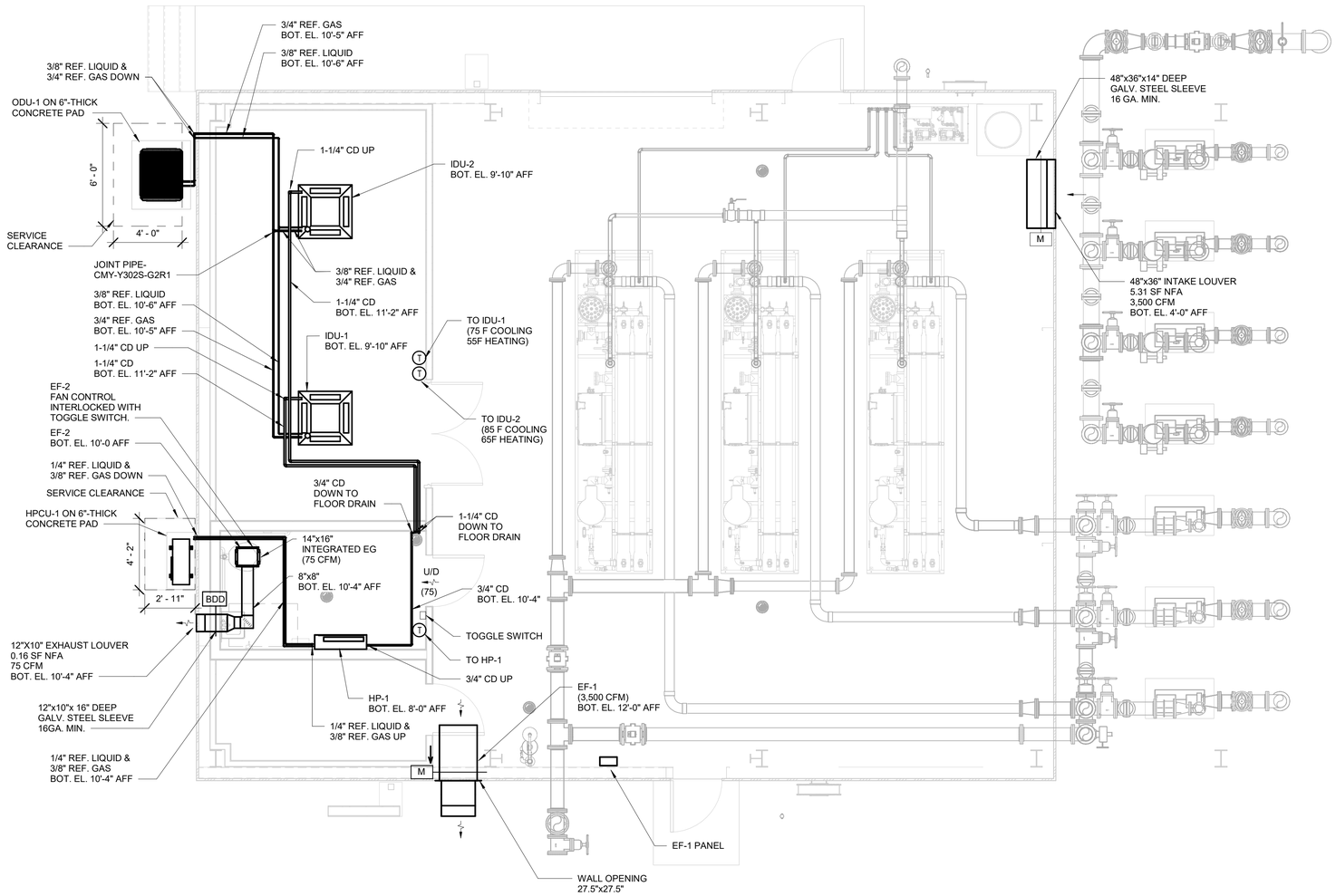
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

MECHANICAL
LEGEND, ABBREVIATIONS AND
NOTES

SHEET NO. 39
DWG NO. H-1
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SCALE: 1/4" = 1'-0"

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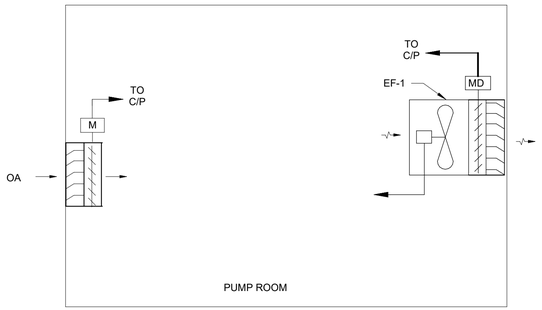
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

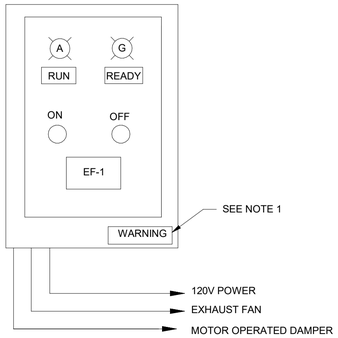
MECHANICAL
FLOOR PLAN

SHEET NO. 40
DWG NO. H-2
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LEGEND

	WALL MOUNTED FAN		DAMPER, PARALLEL
A	AMBER LIGHT (EQUIPMENT ON)		LOUVER
R	RED LIGHT (EQUIPMENT OFF)	M	ELECTRIC ACTUATOR
G	GREEN LIGHT (EQUIPMENT READY)	TH	THERMOSTAT
CP	CONTROL PANEL	H O A	HAND OFF-AUTO SWITCH
EA	EXHAUST AIR		
OA	OUTSIDE AIR		
SA	SUPPLY AIR		

VENTILATION SYSTEM - SEQUENCE OF OPERATION (EF-1)

GENERAL

1. CONTRACTOR SHALL PROVIDE ALL CONTROLS, CABLE, CONDUIT, EQUIPMENT, DEVICES, PANELS, INTERLOCKS, RELAYS, CONTROLLERS, ETC. AS REQUIRED TO COMPLETE ALL SEQUENCES OF OPERATIONS AS SHOWN.
2. COORDINATE POWER AND WIRING WITH OTHER TRADES.

INTERLOCKS:

1. AS SHOWN IN SCHEDULE.

FAN OPERATION: (EF-1)

EXHAUST FAN: FAN SHALL OPERATE VIA ON/OFF BUTTON. RUN LIGHT SHALL ILLUMINATE WHEN FAN HAS BEEN COMMANDED TO RUN, OTHERWISE THE READY LIGHT SHALL BE ILLUMINATED

ON POSITION: FAN SHALL ACTIVATE ONCE ALL ASSOCIATED DAMPERS HAVE PROVEN OPEN VIA END SWITCHES. THE FAN SHALL RUN CONTINUOUSLY.

OFF POSITION: FAN SHALL DEACTIVATE AND ALL ASSOCIATED DAMPERS SHALL CLOSE.

INTERLOCK SCHEDULE

UNIT NO.	LOCATION	AREA SERVED	INTERLOCKS		PANEL NOTES
			WITH	CONTROL	
EF-1	WALL	PUMP ROOM 106	MOD	ON/OFF	1-3

PANEL NOTES

1. PLACE A RED WARNING SIGN CONSPICUOUSLY ON THE FACE OF EACH HVAC CONTROL PANEL WHICH READS AS FOLLOWS:

> WARNING
> THIS PANEL IS CONNECTED TO MULTIPLE SOURCES OF POWER

2. PANEL SHALL BE NEMA 12 WITH DOOR INTERLOCKED DISCONNECT.
3. PROVIDE EQUIPMENT NUMBER UNDER EACH OPERATING CONTROL.

HEAT PUMP - SEQUENCE OF OPERATION (HP-1 & HPCU-1)

GENERAL

1. CONTRACTOR SHALL PROVIDE ALL CONTROLS, CABLE, CONDUIT, EQUIPMENT, DEVICES, PANELS, INTERLOCKS, RELAYS, CONTROLLERS, ETC. AS REQUIRED TO COMPLETE ALL SEQUENCES OF OPERATIONS AS SHOWN.
2. COORDINATE POWER AND WIRING WITH OTHER TRADES.

HEAT PUMP OPERATION: (HP-1 & HPCU-1)

1. THE UNIT SHALL OPERATE UNDER BUILT-IN CONTROLS BY UNIT MANUFACTURER. THE UNIT SHALL ENABLE CONTINUOUS OPERATION AS REQUIRED TO MAINTAIN THE SPACE TEMPERATURE SETPOINTS VIA THE WALL MOUNTED THERMOSTAT.
2. SET SPACE COOLING AT 85 F (ADJ) AND HEATING TEMPERATURES AT 65 F (ADJ)

VARIABLE REFRIGERANT FLOW - SEQUENCE OF OPERATION (IDU-1, IDU-2 & ODU-1)

GENERAL

1. CONTRACTOR SHALL PROVIDE ALL CONTROLS, CABLE, CONDUIT, EQUIPMENT, DEVICES, PANELS, INTERLOCKS, RELAYS, CONTROLLERS, ETC. AS REQUIRED TO COMPLETE ALL SEQUENCES OF OPERATIONS AS SHOWN.
2. COORDINATE POWER AND WIRING WITH OTHER TRADES.

VARIABLE REFRIGERANT FLOW: (IDU-1, IDU-2 & ODU-1)

1. THE UNIT SHALL OPERATE UNDER BUILT-IN CONTROLS BY UNIT MANUFACTURER. THE UNIT SHALL ENABLE CONTINUOUS OPERATION AS REQUIRED TO MAINTAIN THE SPACE TEMPERATURE SETPOINTS VIA THE WALL MOUNTED THERMOSTAT.
2. IDU-1 SET SPACE COOLING AT 75 F (ADJ) AND HEATING TEMPERATURES AT 55 F (ADJ).
3. IDU-2 SET SPACE COOLING AT 85 F (ADJ) AND HEATING TEMPERATURES AT 65 F (ADJ).

NO.	BY	DATE	SYMBOL	REVISIONS
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Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
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DESIGN ENGINEER
JACK C. WANG
FLORIDA REGISTRATION NO.
81017

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

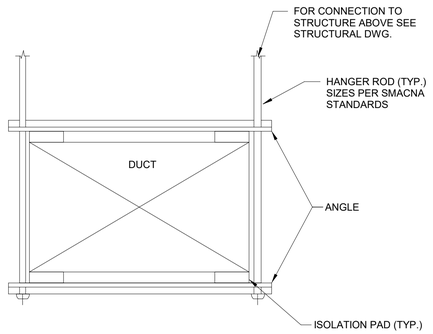
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

MECHANICAL
CONTROLS

SHEET NO. 41
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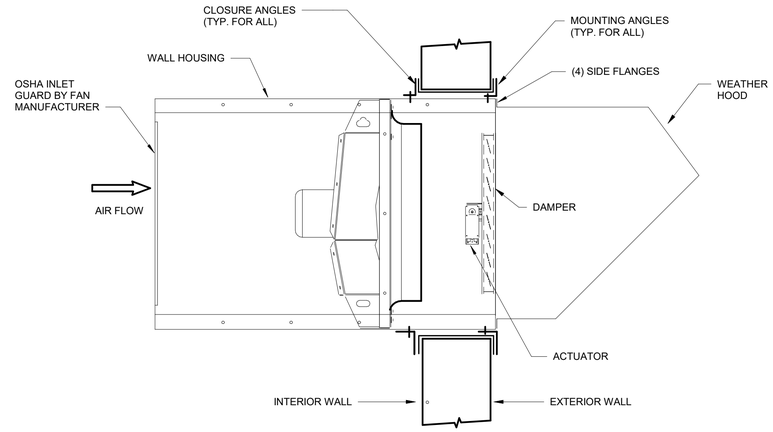
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NOTES:

1. THE PEMB MANUFACTURE SHALL COORDINATE UNIT SUPPORT.
2. DISTANCE BETWEEN DUCT HANGERS SHALL BE IN ACCORDANCE WITH SMACNA STANDARD

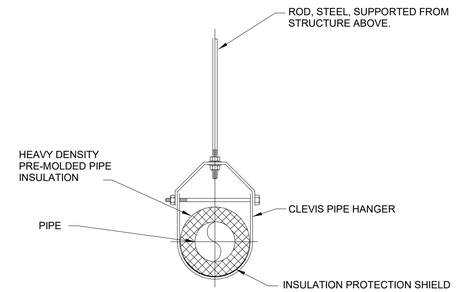
HANGING DUCTWORK



NOTES:

1. FAN INSTALLATION DETAILS SHALL BE AS PER FAN MANUFACTURER RECOMMENDATIONS. THE PEMB CONTRACTOR SHALL COORDINATE FAN SUPPORT.
2. PROVIDE OSHA INLET GUARD FURNISHED BY FAN MANUFACTURER
3. PROVIDE ALL ADDITIONAL SUPPLEMENTARY STEEL, SHIMS, WOOD BLOCKING, ETC. AS REQUIRED FOR A COMPLETE INSTALLATION.
4. MOTOR IS ACCESSIBLE FROM INTERIOR OF THE BUILDING.

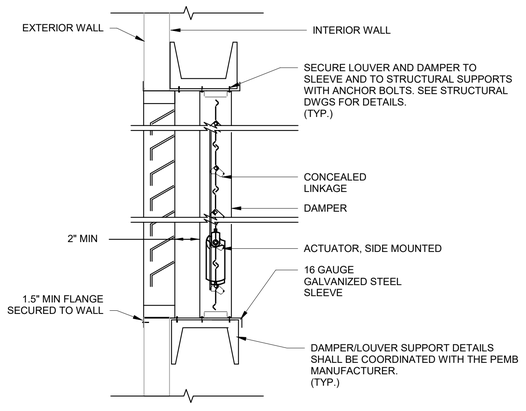
WALL MOUNTED FAN DETAIL



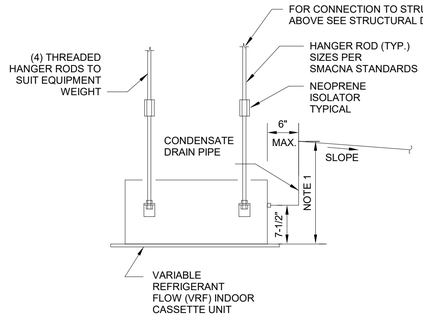
NOTES

1. PROVIDE HANGER SUPPORT FROM STRUCTURE ABOVE AS PER SPECIFICATION SECTION 15060.
2. PIPE HANGERS LONGER THAN 18" SHALL HAVE A LATERAL BRACE EVERY 4TH HANGER.

CLEVIS HANGER FOR INSULATED PIPE



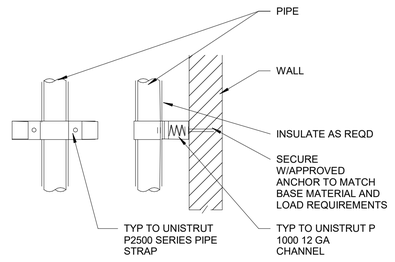
LOUVER AND DAMPER IN SLEEVE DETAIL



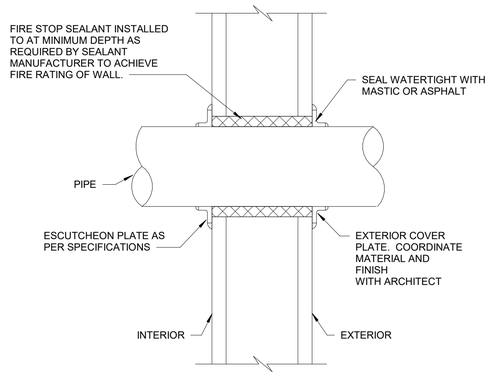
NOTES:

1. THE DRAIN LIFT FOR 33"x33" CASSETTE UNITS IS MAX. 33"
2. PROVIDE SLOPE OF 1" PER 20 FT FOR THE CONDENSATE DRAIN PIPES.

INDOOR CASSETTE UNIT HANGING SUPPORT TYPICAL DETAIL



VERTICAL PIPE SUPPORT



PIPE PENETRATION THRU EXTERIOR WALL

NO.	BY	DATE	SYMBOL	REVISIONS
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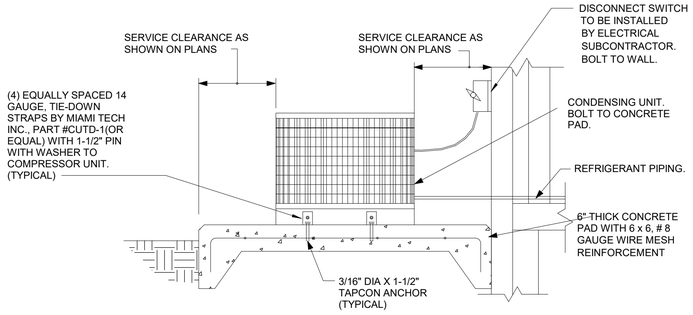
St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

MECHANICAL
DETAILS (SHEET 1 OF 2)

SHEET NO. 42
DWG NO. H-4
100% SUBMITTAL

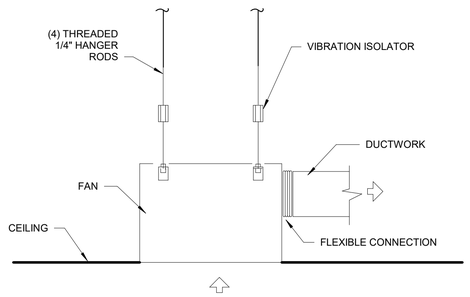
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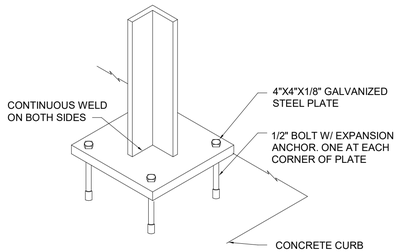
NOTE:

1. CLEARANCE SHOWN ON DETAIL IS FROM BASIS OF DESIGN EQUIPMENT'S MANUFACTURER'S RECOMMENDATIONS.

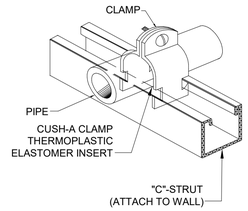
CONDENSING UNIT DETAIL

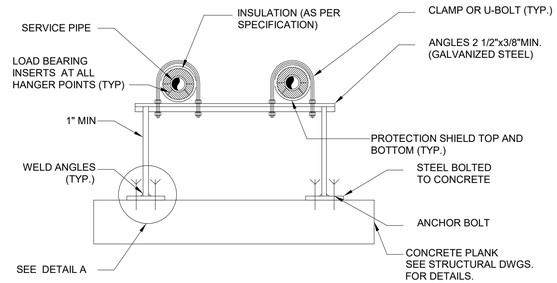


CEILING FAN HANGING DETAIL



DETAIL A





NOTE:

1. DISTANCE BETWEEN PIPE SUPPORTS SHALL BE A MAXIMUM OF 5'.
2. PROVIDE THERMAL INSULATION AS REQUIRED PER SPECIFICATION.
3. PIPE SUPPORT SHALL MEET REQUIREMENTS FROM SPECIFICATION SECTION 15062.

PIPE SUPPORT DETAILS

NO.	BY	DATE	SYMBOL	REVISIONS
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PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

MECHANICAL
DETAILS (SHEET 2 OF 2)

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FAN SCHEDULE

TAG	LOCATION	AREA SERVED	MANUFACTURER & MODEL NO.	FAN TYPE	DRIVE	AIR FLOW CFM	ESP IN. WC.	FAN RPM	BHP	FLA A	MOTOR TYPE	MOTOR RPM	MOTOR HP	MOTOR V/PH/Hz	WEIGHT LBS	INLET dBA (AT 5')	NOTES
EF-1	PUMP ROOM 106	PUMP ROOM	GREENHECK - AER-20-VG	WALL MOUNTED	DIRECT	3,500	0.35	1,565	0.63	2.90	TEFC	1,725	1	460/3/60	260	74	1-11
EF-2	RESTOOM 101	RESTROOM	GREENHECK - SP-A250	CEILING MOUNTED	DIRECT	75	0.35	700	-	0.56	TENV	-	83 WATTS	115/1/60	30	-	11 - 16

NOTES
1. ALUMINUM FAN CONSTRUCTION, HOUSING AND WHEEL
2. CAST ALUMINUM BLADE PROPELLER
3. FLUSH EXTERIOR WALL HOUSING W/OSHA APPROVED INLET GUARD
4. CLOSURE ANGLES
5. 45-DEGRE ALUMINUM WEATHERHOOD W/ BIRDSCREEN, COATED
6. THERMAL OVERLOAD
7. VARI-GREEN EC MOTOR W/WIRING PACKAGE
8. MOTOR MOUNTED CONTROL DIAL FOR BALANCING
9. MOTORIZED DAMPER WITH NEMA 12 ACTUATOR
10. HI-PRO POLYESTER COATING (FAN AND ACCESSORIES), WEATHER HOOD AND DAMPER
11. NEMA 12 DISCONNECT SWITCH
12. HANGERS WITH SPRING ISOLATORS
13. FACTORY TOGGLE SWITCH
14. SOLID STATE SPEED CONTROL, 6 AMP.
15. ADJUSTABLE MOUNTING BRACKET
16. ALUMINUM GRILLE AND WHEEL

SPLIT SYSTEM HEAT PUMP UNIT SCHEDULE

TAG	AREA SERVED	MANUFACTURER	MODEL	AIR FLOW CFM	OUTSIDE AIR FLOW CFM	COOLING COIL MAX. TOTAL CAPACITY BTUH	COOLING COIL TOTAL CAPACITY AT 89.8 F BTUH	COOLING COIL SENSIBLE CAPACITY AT 89.8 F BTUH	HEATING COIL MAX. CAPACITY BTUH	HEATING COIL CAPACITY AT 36.2 F BTUH	HEATING COIL LAT	ELECTRICAL V/PH/HZ	ELECTRICAL MCA AMPS	WEIGHT LBS	NOTES
HP-1	RESTROOM 101	TRANE /MITSUBISHI	MSZ-FX06NL	420	0	14,000	6,699	5,717	20,000	14,453	92.8	-	-	32	1 - 7

NOTES
1. DDC 24/7 WALL MOUNTED THERMOSTAT
2. RATED FOR REFRIGERANT R454B
3. THE REFRIGERANT PIPE SIZES, FITTINGS, ROUTING, LAYOUT, ETC. MUST BE REVIEWED AND APPROVED BY THE EQUIPMENT MANUFACTURER BEFORE SUBMISSION TO THE ENGINEER IN CHARGE FOR REVIEW
4. POWER FROM HPCU-1
5. DISCONNECT SWITCH NEMA 12
6. FACTORY FIELD INSTALLED REFRIGERANT LEAK SENSOR
7. SYSTEM REFRIGERANT CHARGE LESS THAN 6.6 LB.

SPLIT SYSTEM HEAT PUMP CONDENSING UNIT SCHEDULE

TAG	MANUFACTURER	MODEL	LOCATION	SERVED EQUIPMENT	MAXIMUM TOTAL COOLING CAPACITY BTUH	TOTAL COOLING CAPACITY AT 89.8 F BTUH	SENSIBLE COOLING CAPACITY AT 89.8 F BTUH	MAXIMUM HEATING CAPACITY BTU'H	HEATING CAPACITY AT 36.2 F BTUH	ELECTRICAL V/PH/HZ	ELECTRICAL MOP AMPS	ELECTRICAL MCA AMPS	WEIGHT LBS	HSPF2	SEER2	NOTES
HPCU-1	TRANE / MITSUBISHI	MUZ-FX06NHLZ	OUTDOOR	HP-1	14,000	6,699	5,717	20,000	14,453	230/1/60	12	12	90	13	35	1 - 6

NOTES
1. NEMA 3R DISCONNECT SWITCHES
2. 6" THICK CONCRETE PAD
3. DEDICATED POWER CONNECTIONS
4. INSTALLATION OF UNITS SHALL COMPLY WITH SPECIFICATION 15050 FOR VIBRATION AND WIND CONTROLS
5. SYSTEM REFRIGERANT CHARGE LESS THAN 6.6 LB.
6. R454B REFRIGERANT

VARIABLE REFRIGERANT FLOW (VRF) INDOOR UNIT SCHEDULE

TAG	ROOM SERVED	MANUFACTURER	MODEL	AIRFLOW CFM	OUTSIDE AIR FLOW CFM	ESP IN WG	COOLING DATA NOMINAL CAPACITY BTUH	COOLING DATA TOTAL CAPACITY AT 89.8 F BTUH	COOLING DATA SENSIBLE CAPACITY AT 89.8 F BTUH	COOLING DATA LAT °F	HEATING DATA NOMINAL CAPACITY MBH	HEATING DATA CAPACITY AT 36.2 F MBH	HEATING DATA LAT °F	ELECTRICAL ELECTRIC POWER V/PH/HZ	ELECTRICAL FAN FLA AMP	ELECTRICAL FAN MCA AMP	ELECTRICAL FAN MOCP AMP	WEIGHT LB	NOTES
IDU-1	ELECTRICAL CONTROL ROOM 100	TRANE /MITSUBISHI	PLFY-EM48NEMU-A	1,095	0	FREE DISCHARGE	48.0	48.5	34.9	58	54.0	36.7	95	230/1/60	1.01	1.26	15	60	1 - 7
IDU-2	ELECTRICAL CONTROL ROOM 100	TRANE /MITSUBISHI	PLFY-EM48NEMU-A	1,092	0	FREE DISCHARGE	48.0	48.5	34.9	58	54.0	36.7	95	230/1/60	1.01	1.26	15	60	1 - 7

NOTES
1. DDC 24/7 WALL MOUNTED PROGRAMMABLE THERMOSTATS
2. INTERNAL CONDENSATE LIFT MECHANISM IS 33" MAX. BY UNIT MANUFACTURER
3. MERV 7 FILTER
4. FACTORY FIELD INSTALLED REFRIGERANT LEAK SENSOR
5. RATED FOR REFRIGERANT R32
6. DISCONNECT SWITCH NEMA 12
7. THE REFRIGERANT PIPE SIZES, FITTINGS, ROUTING, LAYOUT, ETC. MUST BE REVIEWED AND APPROVED BY THE EQUIPMENT MANUFACTURER BEFORE SUBMISSION TO THE ENGINEER IN CHARGE FOR REVIEW

VARIABLE REFRIGERANT FLOW (VRF) OUTDOOR UNIT SCHEDULE

TAG	MANUFACTURER	MODEL	LOCATION	SERVED EQUIPMENT	NOMINAL COOLING CAPACITY BTUH	MAXIMUM TOTAL COOLING CAPACITY AT 89.8 F BTUH	MAXIMUM SENSIBLE COOLING CAPACITY AT 89.8 F BTUH	NOMINAL HEATING CAPACITY BTUH	HEATING CAPACITY AT 36.2 F BTUH	ELECTRICAL V/PH/HZ	ELECTRICAL MCA AMPS	ELECTRICAL RFS AMPS	ELECTRICAL MOCP AMPS	WEIGHT LBS	EER	IEER	COP	NOTES
ODU -1	TRANE / MITSUBISHI	PUHY-EM96TXU-A	OUTDOOR	IDU 1 & IDU 2	96,000	97,933	70,181	108,000	86,059	460/3/60	22	36	35	630	14.8	27.7	4.58	1-6

NOTES:
1. NEMA 3R DISCONNECT SWITCHES
2. 6" THICK CONCRETE PAD
3. DEDICATED POWER CONNECTIONS
4. INSTALLATION OF UNITS SHALL COMPLY WITH SPECIFICATION 15050 FOR VIBRATION AND WIND CONTROLS
5. JOINT PIPE- CMY-Y302S-G2R1
6. R32 REFRIGERANT

NO.	BY	DATE	SYMBOL	REVISIONS
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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	C. MARTINEZ
DRAWN BY:	C. MARTINEZ
DATE:	JUNE 2026
CHECKED BY:	J. WANG
DATE:	JUNE 2026

DESIGN ENGINEER
JACK C. WANG
FLORIDA REGISTRATION NO.
81017

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

MECHANICAL
SCHEDULE

SHEET NO. 44
DWG NO. H-6
100% SUBMITTAL

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PLUMBING SYMBOLS

- DOMESTIC COLD WATER
- DOMESTIC HOT WATER PIPING
- TEMPERED WATER (TW)
- HOT WATER RETURN PIPING
- VENT PIPING
- STORM DRAIN PIPING (ST)
- SANITARY PIPING (ABOVEGROUND) (S)
- SANITARY PIPING BELOW GROUND (SAN)
- WASTE PIPING (W)
- NATURAL GAS PIPING (NG)
- GAS VENT PIPING (GV)
- DEMOLISH PIPING
- ABANDON PIPING
- DEMOLISH FIXTURE
- DETECTOR (CARBON MONOXIDE AND COMBUSTIBLE GAS) (D)
- PIPE DOWN
- PIPE UP
- PIPE RISE
- GAS COCK (GAS VALVE)
- GATE VALVE OR BALL VALVE
- PRESSURE REDUCING VALVE
- TRAP
- CHECK VALVES
- FD — FLOOR DRAIN
- RD OD FD — ROOF DRAIN/AREA DRAIN
- SHOWER HEAD
- PIPE REDUCER
- PIPE UNION
- TEMPERATURE & PRESSURE RELIEF VALVE
- DIRECTION OF FLOW
- HOSE BIBB
- CLEANOUT
- CLEANOUT DECK PLATE
- PIPE CAP
- LIMITS OF VENDOR
- LIMITS OF WORK
- CONNECTION TO EXISTING SYSTEM
- POINT OF DISCONNECTION
- PLUG VALVE
- M — NG METER
- NG REGULATOR

A / X X X — IDENTIFICATION TARGET:
A = DETAIL NUMBER
XXX = SHEET NUMBER ON WHICH DETAIL IS LOCATED

PLUMBING ABBREVIATIONS

AFF	ABOVE FINISHED FLOOR	IE	INVERT ELEVATION
A.D.	ACCESS DOOR	IW	INDIRECT WASTE
AV	ACID VENT	KS	KITCHEN SINK
AW	ACID WASTE	LAV	LAVATORY
CO	CLEANOUT	L	LEADER
CODP	CLEANOUT DECK PLATE	MS	MOP SINK
C.L. ℄	CENTER LINE	NG	NATURAL GAS
CFH	CUBIC FEET PER HOUR	N.I.C.	NOT IN CONTRACT
CW	DOMESTIC COLD WATER	NFWH	NON-FREEZE WALL HYDRANT
DCDA	DOUBLE CHECK DETECTOR ASSEMBLY	P/	PER
DN.	DOWN	RD	ROOF DRAIN
DWG.	DRAWING	RM	ROOM
EL	ELEVATION	PRV	PRESSURE REDUCING VALVE
EM EW	EMERGENCY EYE WASH	RPZ	REDUCED PRESSURE ZONE
EES	EMERGENCY EYEWASH + SHOWER	RT	RUNNING TRAP
EXIST (E)	EXISTING	S/SAN	SANITARY
FAI	FRESH AIR INLET	SH	SHOWER
FD	FLOOR DRAIN	SH DR	SHOWER DRAIN
FUNN.	FUNNEL DRAIN	SL	SLEEVE
FT	FOOT/FEET	SPD	SUMP PUMP DISCHARGE
FIN.	FINISH	SS	SAMPLE SINK
FL.	FLOOR	SVW	SERVICE WATER (NON-POTABLE)
F.U.	FIXTURE UNITS	TYP	TYPICAL
G	GAS	TD	TRENCH DRAIN
GAL	GALLONS	TW	TEMPERED WATER
GPF	GALLONS PER FLUSH	UR	URINAL
GPH	GALLONS PER HOUR	V	VENT
GPM	GALLONS PER MINUTE	VTR	VENT THROUGH ROOF
HB	HOSE BIBB	W	WASTE
HP	HORSEPOWER	WC	WATER CLOSET
HW	DOMESTIC HOT WATER	WCO	WALL CLEANOUT
HWR	DOMESTIC HOT WATER RETURN	WH	WATER HEATER
		WHA	WATER HAMMER ARRESTER

GENERAL PLUMBING NOTES

1. THE CONTRACTOR SHALL OBTAIN ANY AND ALL PERMITS REQUIRED FOR THE PERFORMANCE OF WORK AND PAY ALL FEES IN CONNECTION THEREWITH.
2. CONTRACTOR SHALL CHECK AND VERIFY THE EXACT LOCATION OF ALL PIPE PENETRATIONS, PIPE ELEVATIONS, AREA DRAINS, ETC.
3. PROVIDE SHUT OFF VALVES AND UNIONS/FLANGES AT BASE OF ALL RISERS, MAINS, ALL BRANCHES AND ALL FIXTURE/EQUIPMENT CONNECTIONS IN ORDER TO ISOLATE FOR MAINTENANCE PURPOSES.
4. PROVIDE ACCESS DOORS FOR VALVES, AND ANY OTHER EQUIPMENT AND ACCESSORIES THAT REQUIRE ACCESS FOR MAINTENANCE OR OPERATION WHICH ARE LOCATED BEHIND WALLS AND PARTITIONS OR CONCEALED IN HUNG CEILINGS. COORDINATE INSTALLATION WITH GENERAL CONTRACTOR.
5. THE CONTRACTOR SHALL COORDINATE PLUMBING WORK WITH ALL OTHER TRADES AND VERIFY DIMENSION AND CONDITIONS AT THE SITE PRIOR TO BEGINNING WORK. NO ADDITIONAL COSTS WILL BE ACCEPTED IF ATTRIBUTED TO FAILURE TO COORDINATE OR VERIFY.
6. ALL PLUMBING LINES SHOWN ARE DIAGRAMMATIC AND NOT INTENDED TO SHOW EXACT LOCATIONS. THE CONTRACTOR SHALL INSTALL PIPING SYSTEM TO MINIMIZE LENGTH OF RUNS AND AVOID INTERFERENCES.
7. ALL PIPING BELOW GRADE SHALL BE INSTALLED TO CLEAR FOOTINGS AND SHALL NOT BE INSTALLED WITHIN OR BELOW THE TRIANGULAR BEARING PLANE OF ALL FOOTINGS.
8. THE CONTRACTOR SHALL PROVIDE SEAL SLEEVES INSTALLED IN FIRE-RATED WALLS, CEILINGS AND FLOORS WITH FIRE-PROOF MATERIAL EQUAL TO THE RATING OF THE RESPECTIVE WALLS, CEILINGS AND FLOORS.
9. INSTALL PIPING AS STRAIGHT AND DIRECT AS POSSIBLE FORMING RIGHT ANGEL OR PARALLEL LINES WITH BUILDING WALLS, NEATLY SPACED, RISERS PLUMB AND TRUE, AND AVOID INTERFERENCE WITH OTHER CONSTRUCTION.
10. ALL PIPE SLEEVES SHALL BE COORDINATED WITH STRUCTURAL ENGINEER FOR SIZE, LOCATION AND ELEVATION.

PIPE SCHEDULE

SYSTEM	LOCATION	MATERIAL	TYPE	STANDARD	JOINTS	FITTINGS
DOMESTIC WATER	ABOVE GROUND	COPPER	TYPE L	ASTM B88	SOLDERED	WROUGHT COPPER
DOMESTIC WATER	BURIED	COPPER	TYPE K	AWWA C800	SERVICE LINE COMPRESSION	BRASS
SANITARY/VENT	ABOVE GROUND	PVC	SCH 40 SOLID WALL	ASTM D 1784	SOLVENT CEMENT	PVC DWV
SANITARY/VENT	BURIED	PVC	SCH 40 SOLID WALL	ASTM D 2321	SOLVENT CEMENT	PVC DWV

FIXTURE SCHEDULE

TAG	FIXTURE TYPE	WASTE	VENT	HOT WATER	COLD WATER	DESCRIPTION
LAV	LAVATORY	1-1/2"	1-1/2"	1/2"	1/2"	WALL MOUNTED
WC	WATER CLOSET	4"	2"	-	1"	FLOOR MOUNTED

ELECTRIC WATER HEATER SCHEDULE

TAG NO.	LOCATION	TYPE	KW	AMPS	VOLTS	PHASE	TEMPERATURE RISE	GPM	MANUFACTURER	MODEL	NOTES
WH-1	RESTROOM	INSTANTANEOUS	2.4	20	120	1	33°	0.5	EEMAX	SPEX2412T	-

EMERGENCY EYEWASH + SHOWER SCHEDULE

TAG NO.	LOCATION	MANUFACTURER	MODEL	TYPE	FLOW RATE (GPM)	NOTES
EES-1	PUMP ROOM	BRADLEY	S19314FSS	316 STAINLESS STEEL COMBINATION EYEWASH/SHOWER	20	INCLUDE FLOW SWITCH AND LOCAL ALARM

NO.	BY	DATE	SYMBOL	REVISIONS
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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	D. STICCO
DRAWN BY:	D. STICCO
DATE:	JUNE 2026
CHECKED BY:	C. KEOUGH
DATE:	JUNE 2026

DESIGN ENGINEER
COLUM P. KEOUGH
FLORIDA REGISTRATION NO.
89450

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

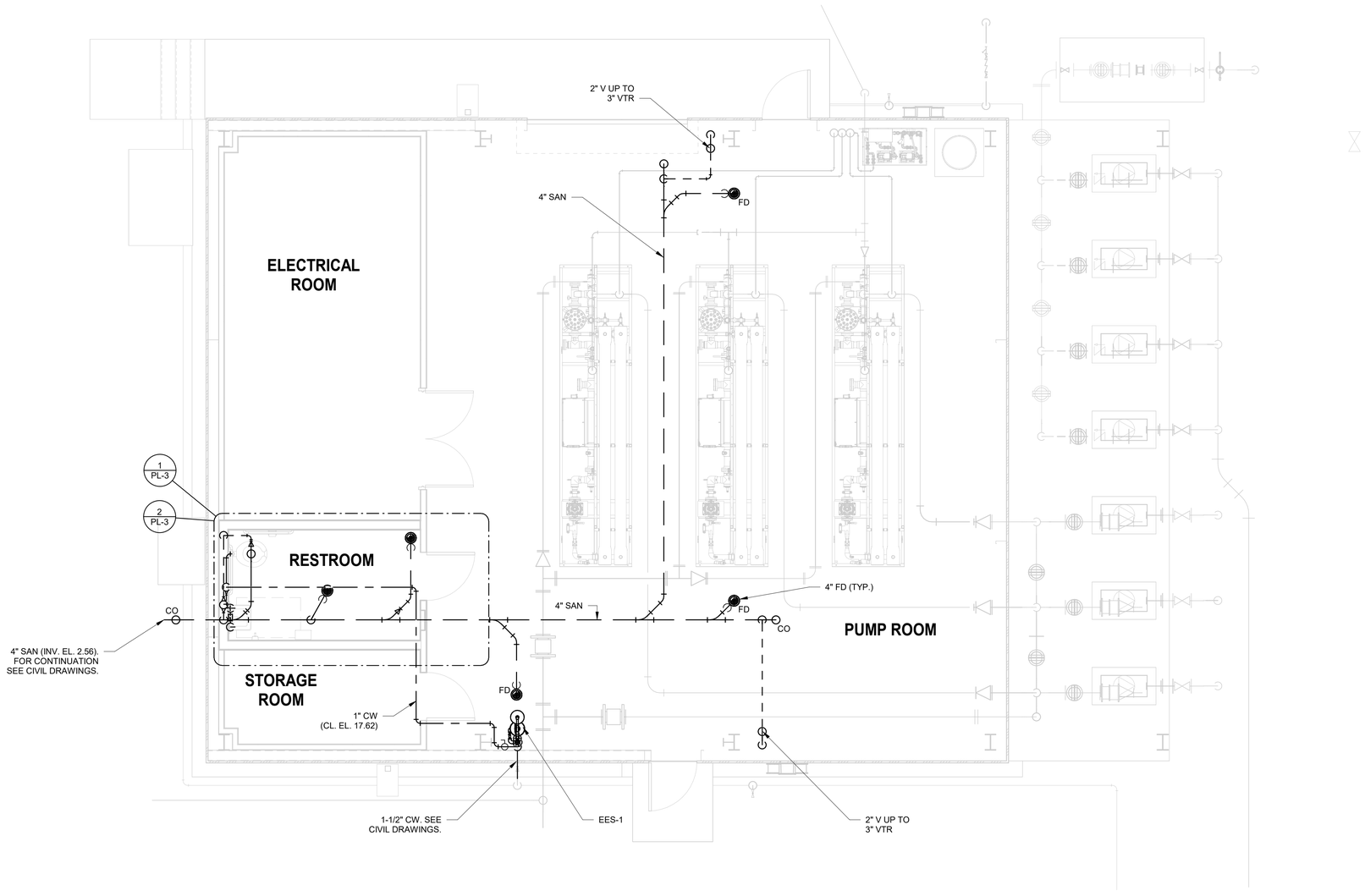
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

PLUMBING
NOTES, SYMBOLS, ABBREVIATIONS, AND SCHEDULES

SHEET NO. 45
DWG NO. PL-1
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1 1 - Plumbing
1/4" = 1'-0"

0 2 4 8
SCALE: 1/4" = 1'-0"

NO.	BY	DATE	SYMBOL	REVISIONS
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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	D. STICCO
DRAWN BY:	D. STICCO
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DESIGN ENGINEER
COLUM P. KEOUGH
FLORIDA REGISTRATION NO.
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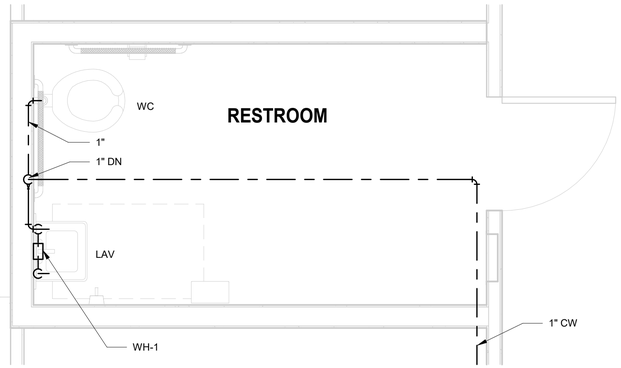
St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

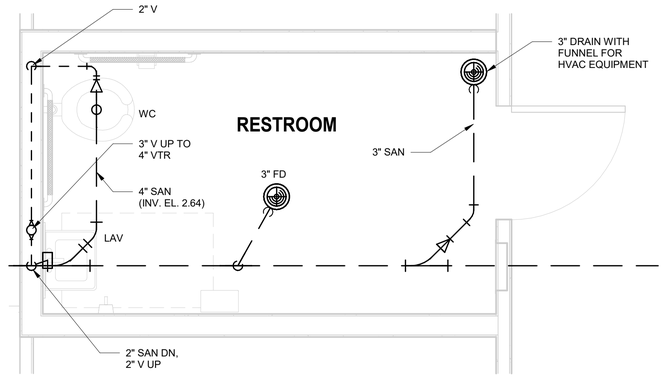
PLUMBING
FLOOR PLAN

SHEET NO. 46
DWG NO. PL-2
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1 DOMESTIC WATER - PARTIAL PLAN
1/2" = 1'-0"



2 SANITARY - PARTIAL PLAN
1/2" = 1'-0"

0 1 2 4
SCALE: 1/2" = 1'-0"

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COLUM P. KEOUGH
FLORIDA REGISTRATION NO.
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St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

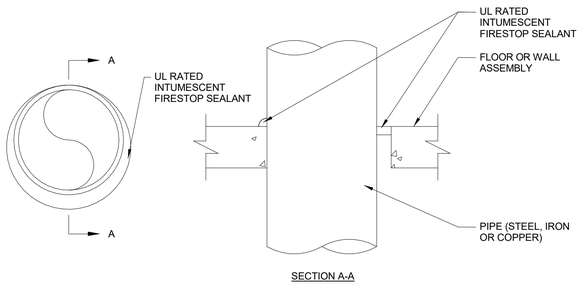
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

PLUMBING
PARTIAL PLANS

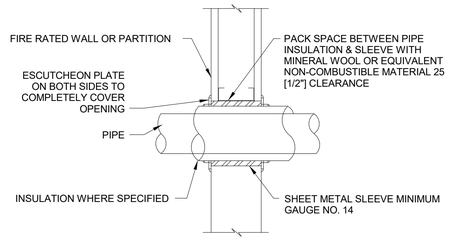
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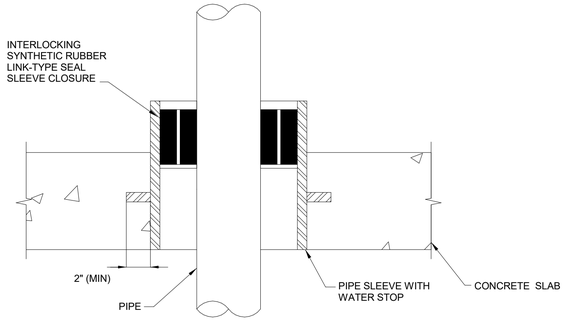
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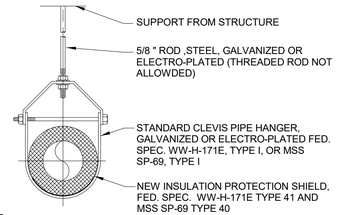
PIPE PENETRATION (PER UL NO. C-AJ-1291) 1
NTS



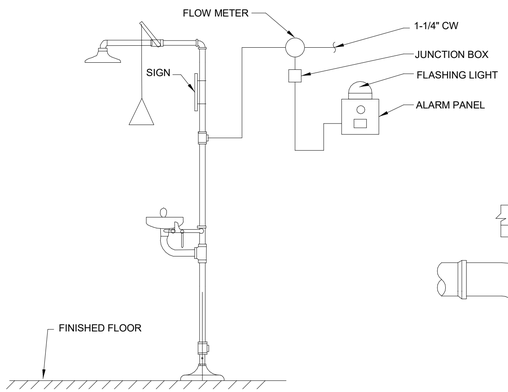
PIPE PENETRATION THRU INTERIOR WALL 2
NTS



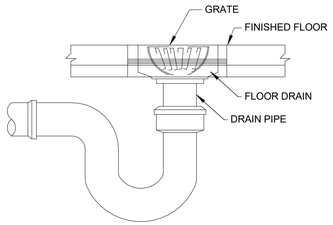
SLEEVE CLOSURE THROUGH CONCRETE SLAB 3
NTS



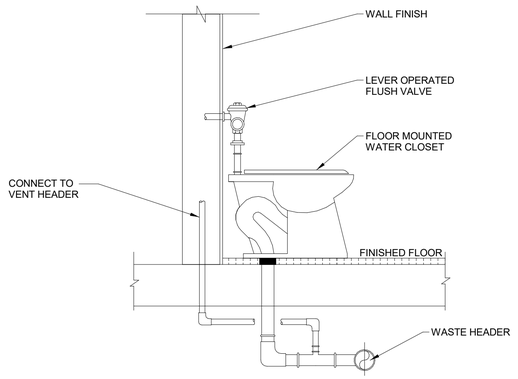
CEILING HUNG CLEVIS HANGER FOR INSULATED PIPE 4
NTS



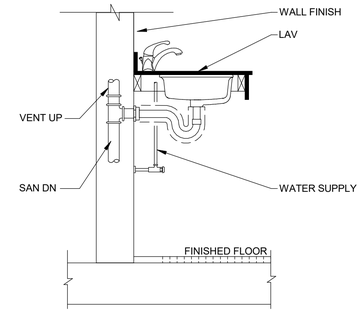
EMERGENCY EYEWASH SHOWER DETAIL 5
NTS



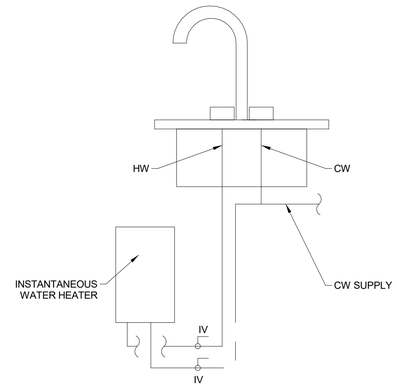
FLOOR DRAIN 6
NTS



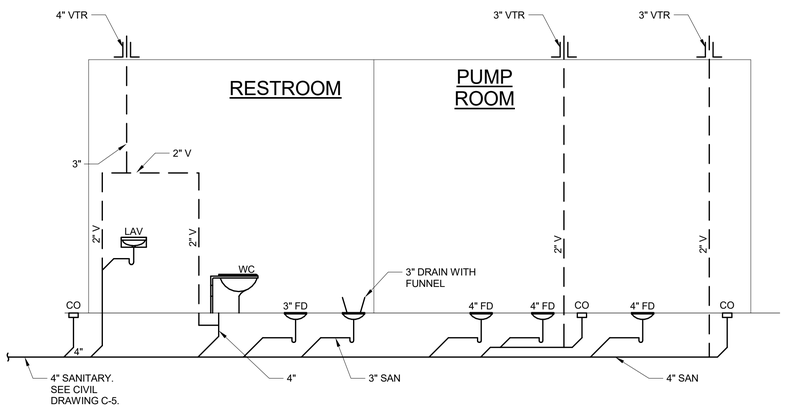
FLOOR MOUNTED WATER CLOSET DETAIL 10
NTS



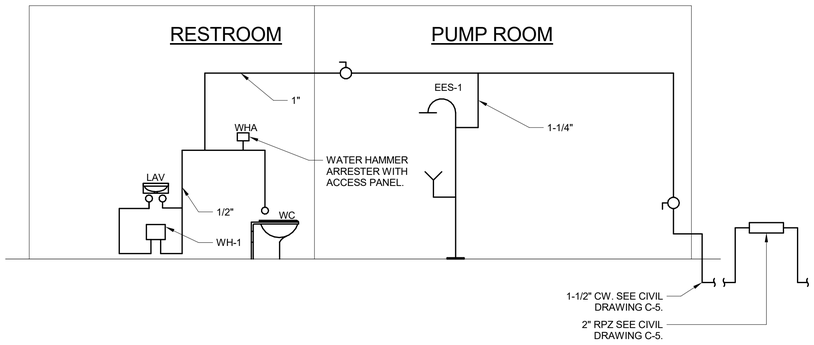
LAVATORY DETAIL 8
NTS



WATER HEATER DETAIL 9
NTS



SANITARY RISER DIAGRAM



DOMESTIC WATER RISER DIAGRAM

NO.	BY	DATE	SYMBOL	REVISIONS
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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	D. STICCO
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DESIGN ENGINEER
COLUM P. KEOUGH
FLORIDA REGISTRATION NO.
89450

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

PLUMBING
DETAILS AND RISER DIAGRAM

SHEET NO.
48
DWG NO.
PLD-1
100% SUBMITTAL

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GENERAL NOTES

1. ALL WORK SHALL CONFORM TO THE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE, NATIONAL ELECTRIC SAFETY CODE, N.F.P.A., O.S.H.A. REGULATIONS AND ALL OTHER EXISTING CODES AND REGULATIONS OF AUTHORITIES WHICH HAVE JURISDICTION.

2. THE CONTRACT DRAWINGS ARE DIAGRAMMATIC IN NATURE AND NOT EVERY DETAIL OR CONDUIT IS SHOWN. EXISTING CONDITIONS AND DIMENSIONS SHALL BE VERIFIED IN THE FIELD BEFORE COMMENCING ANY FABRICATION, ORDERING ANY MATERIAL, OR PERFORMING ANY WORK. ANY DEPARTURE FROM CONCEPT SHOWN ON THE CONTRACT DRAWINGS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL. ALL ELECTRICAL EQUIPMENT SHOWN ON THE DRAWINGS AND/OR REQUIRED FOR THE FULL INTEGRITY OF THE CONTRACT SHALL BE FURNISHED, INSTALLED AND CONNECTED BY THE CONTRACTOR, EXCEPT WHERE EQUIPMENT SHOWN IS IDENTIFIED AS "EXISTING" OR OTHERWISE NOTED ON THE DRAWINGS.

3. UNLESS OTHERWISE NOTED, EQUIPMENT AND MATERIALS TO BE PROVIDED SHALL BEAR LISTING AND LABELING BY A NATIONALLY RECOGNIZED TESTING AGENCY WHERE SUCH STANDARD HAD BEEN ESTABLISHED FOR THAT TYPE OF EQUIPMENT/MATERIAL.

4. THE CONTRACTOR SHALL SUBMIT DETAILED EQUIPMENT LAYOUT PLANS, SECTIONS, AND MOUNTING DETAILS SHOWING PROPOSED LOCATION OF ALL EQUIPMENT AND REQUIRED WORKING/SERVICE CLEARANCES PRIOR TO INSTALLATION.

5. CONTRACTOR SHALL VISIT THE PROJECT SITE AND EXAMINE AND CONFIRM EXISTING CONDITIONS. ALL CHANGES SHALL BE PRESENTED DURING SHOP DRAWING SUBMITTALS FOR ENGINEER'S APPROVAL.

6. CONDUITS SHALL CONTAIN AN INSULATED GROUND WIRE BONDED TO ENCLOSURES AND SIZED IN ACCORDANCE WITH THE REQUIREMENTS OF THE NEC, IF SIZE IS NOT SHOWN ON THE CONTRACT DRAWINGS.

7. THE CONTRACTOR SHALL PROVIDE CONDUIT FITTINGS, CONNECTORS, CLAMPS, HARDWARE, HANGERS, AND SUPPORTS AS NECESSARY FOR A COMPLETE INSTALLATION.

8. THE CONTRACTOR SHALL PROVIDE TAGS FOR EQUIPMENT, CONDUITS, AND CABLES THAT ARE INSTALLED UNDER THIS CONTRACT. TAG IDENTIFICATIONS SHALL BE IN ACCORDANCE WITH CONTRACT DRAWINGS. TAGS FOR CONDUITS SHALL BE AS DESCRIBED IN SPECIFICATIONS.

9. UNUSED OPENINGS IN CONDUITS, BOXES, DISCONNECT SWITCHES, CABINETS, AND PANEL BOARDS SHALL BE CAPPED OR PLUGGED.

10. UPDATE EXISTING PANELBOARD DIRECTORIES TO REFLECT THE CIRCUITING IN EXISTING PANELBOARDS AFFECTED BY THIS ALTERATION.

11. CONTRACTOR SHALL PROVIDE THE NECESSARY MATERIALS, LABOR AND ATTENDANCE FOR THE OPERATION OF TEMPORARY LIGHT AND CONSTRUCTION POWER AS REQUIRED DURING WORKING HOURS FOR THE ENTIRE CONSTRUCTION PERIOD.

12. CONTRACTOR SHALL MAINTAIN CONTINUITY OF ANY EXISTING CIRCUITS AFFECTED BY THIS ALTERATION. RECONNECT ALL ALTERED OR REROUTED WORK TO ITS FULLY FUNCTIONAL STATE PRIOR TO ALTERATION.

13. PROVIDE ALL NECESSARY TEMPORARY WIRING TO MAINTAIN EXISTING INSTALLATIONS WHICH MUST REMAIN IN SERVICE DURING CONSTRUCTION PERIOD.

14. ALL BRANCH CIRCUITS OVER 75 FEET IN LENGTH SHALL BE RUN WITH #10 CONDUCTOR, UNLESS OTHERWISE NOTED.

15. SCHEDULE ALL DISCONNECTION AND INTERRUPTIONS OF ELECTRICAL SERVICE, COMMUNICATIONS AND SUPERVISORY SYSTEMS WITH THE OWNER AND ENGINEER.

16. CONTRACTORS SHALL FOLLOW ALL OWNER SITE SAFETY WORK PROCESSES AND PROCEDURES, FOR EXAMPLE, WORK PERMITS, SAFETY TASK ANALYSIES, LOCKOUT TAGOUT (LOTO), LOCK, TAG AND TRY, AND RED TAG, ETC.

17. CONTRACTORS SHALL COORDINATE ALL WORK ACTIVITIES WITH OPERATIONS, MAINTENANCE, AND OTHER CONTRACTORS.

18. UNLESS SPECIFICALLY NOTED, ALL ELECTRICAL EQUIPMENT (GENERATORS, AUTOMATIC TRANSFER SWITCHES, PANELBOARDS, MOTOR CONTROLLERS, WIRE, PANELBOARDS, SWITCHBOARDS, DISCONNECTS, LIGHTING, INSTRUMENTS, CONTROL PANELS, MOTOR, ETC) THAT MAY BE SHOWN AS TO BE REMOVED ARE THE PROPERTY OF THE OWNER AND SHALL BE RETURNED TO THE OWNER.

ABBREVIATIONS

A OR AMP	AMPERES
ACT	ABOVE COUNTER TOP (6")
ADJ	ADJACENT
AF	AMP FRAME
AFF	ABOVE FINISHED FLOOR
AHU	AIR HANDLING UNIT
AIC	AMPERE INTERRUPTING CAPACITY
AM	AMMETER
APPROX	APPROXIMATELY
AS	AMMETER SELECTION SWITCH
ASYM	ASYMMETRICAL
AT	AMP TRIP
ATC	AUTOMATIC TRANSFER CONTROLLER
ATS	AUTOMATIC TRANSFER SWITCH
AUX	AUXILIARY
AWG	AMERICAN WIRE GAUGE
BLDG	BUILDING
BOD	BOTTOM OF DUCT BANK
C, CDT	CONDUIT
C, /C	CONDUCTOR
CB	CIRCUIT BREAKER
CCR	CONSTANT CURRENT REGULATORS
CKT	CIRCUIT
CLF	CURRENT LIMITING FUSE
CO	COMPANY
COL	COLUMN
CNTL	CONTROL
CSLD	CONTINUOUS STATISTICAL LEAK DETECTION
CT	CURRENT TRANSFORMER
CBL	CABLE
D	DEPTH
DIA	DIAMETER
DS OR DISC	DISCONNECT SWITCH
DWG(S)	DRAWING(S)
ELEC	ELECTRIC, ELECTRICAL
EM	EMERGENCY
EMT	ELECTRICAL METALLIC TUBING
ESTOP	EMERGENCY STOP
EX, EXIST.	EXISTING
EXP	EXPLOSION PROOF
EF	EXHAUST FAN
EG	EQUIPMENT GROUND
EGC	EQUIPMENT GROUND CONDUCTOR
ETC	ET CETERA
F	FUSE
FCR	FLOAT CONTROL RELAY
FL, FLR	FLOOR
FT	FEET
G OR GND	GROUND
GA	GAUGE
GALV	GALVANIZED
GEC	GROUNDING ELECTRODE CONDUCTOR
GEN	GENERATOR
GF	GROUND FAULT
GFCI	GROUND FAULT CIRCUIT INTERRUPT
GFI	GROUND FAULT INTERRUPTING
H-O-A	HAND-OFF-AUTOMATIC
HP	HORSEPOWER
HVAC	HEATING, VENTILATION & AIR
IG	ISOLATED GROUND
ISBR	INTRINSICALLY SAFE BARRIER RELAY
IMC	INTERMEDIATE METAL CONDUIT
IN	INCH
IR	INFRARED
ISCA	INSTANTANEOUS SHORT CIRCUIT AVAILABLE
JB OR J	JUNCTION BOX
kVA	KILOVOLT - AMPS
kW	KILOWATTS
kWH	KILOWATT-HOUR
L	LENGTH
LA	LIGHTNING ARRESTOR
LFMC	LIQUIDTIGHT FLEXIBLE METAL CONDUIT
LTG	LIGHTING
MAX	MAXIMUM
MCB OR MB	MAIN CIRCUIT BREAKER
MCC	MOTOR CONTROL CENTER
MD	MOTORIZED DAMPER
MECH	MECHANICAL
MER	MECHANICAL EQUIPMENT ROOM
MFR	MANUFACTURER
MH OR MTG	MOUNTING HEIGHT
MIN	MINIMUM
MLO	MAIN LUGS ONLY
MSCP	MASTER STATION CONTROL PANEL
MTD	MOUNTED
N	NEUTRAL
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRICAL CODE
NEMA	NATIONAL ELECTRICAL MFRS ASSOCIATION
NF	NON-FUSIBLE
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
No.	NUMBER
NO	NORMALLY OPEN
NTS	NOT TO SCALE
O.C.	ON CENTER
OCPD	OVERCURRENT PROTECTIVE DEVICE
O/F	OVERFILL
OHE	OVERHEAD ELECTRICAL
OFCI	OWNER FURNISHED CONTRACTOR INSTALL
OSHA	OCCUPATIONAL SAFETY & HEALTH ADMINISTRATION
P	POLE

ABBREVIATIONS

PERM	PERMANENT
PFC	POWER FACTOR CAPACITOR
PH, Ø	PHASE
PLC	PROGRAMMABLE LOGIC CONTROLLER
PM	POWER MONITOR
PNL	PANEL
PR	PAIR
PVC	POLYVINYLCHLORIDE CONDUIT
PWR	POWER
R&R	REMOVE AND RELOCATE

ABBREVIATIONS

R	RELOCATE
RE	RELOCATED
RECEPT	RECEPTACLE
REF	REFERENCE
RGS	RIGID GALVANIZED STEEL
RMS	ROOT MEAN SQUARE
SCCA	SHORT CIRCUIT CURRENT AVAILABLE
SF	SEAL FITTING
SH	SHIELDED
SS	STAINLESS STEEL
SPD	SURGE PROTECTION DEVICE
SW	SWITCH
SWBD	SWITCHBOARD
SYM	SYMMETRICAL
TEL	TELEPHONE
TWIS	TWISTED INDIVIDUAL SHIELD
TWOS	TWISTED OUTER SHIELD
TYP	TYPICAL
UG	UNDERGROUND
UL	UNDERWRITER'S LABORATORIES
UV	ULTRAVIOLET
V	VOLTS
VA	VOLT AMPS
VAC	VOLTS ALTERNATING CURRENT
VDC	VOLTS DIRECT CURRENT
VFD	VARIABLE FREQUENCY DRIVE
VM	VOLTMETER
VMS	VOLTMETER SELECTOR SWITCH
W	WATT
W/	WITH
W/O	WITHOUT
WM	WATTMETER
WP	WEATHER PROOF
XFMR	TRANSFORMER

ONE-LINE DIAGRAM

CONNECTION TO ELECTRICAL UTILITY. VOLTAGE, PHASES AS INDICATED

UTILITY METER

GENERATOR
- 'XX' DESIGNATES POWER RATING
- 'YY' DESIGNATES VOLTAGE

CURRENT TRANSFORMER (CT).
'X:Y' INDICATES RATIO
'Z' INDICATES QUANTITY (1 PER PHASE UNLESS OTHERWISE INDICATED)

POTENTIAL TRANSFORMER (PT).
'X:Y' INDICATES RATIO
'Z' INDICATES QUANTITY (1 PER PHASE UNLESS OTHERWISE INDICATED)

TWO WINDING TRANSFORMER, PHASES AS DETERMINED BY OCPD
-'Z' INDICATES % IMPEDANCE ANSI STANDARD IF NOT SPECIFIED
-'WW' INDICATES STRUCTURE DESIGNATION
-'XX' INDICATES POWER RATING
-'YY' INDICATES PRIMARY VOLTAGE
-'QQ' INDICATES SECONDARY VOLTAGE WINDINGS AS INDICATED
-'Δ' INDICATES DELTA CONNECTION
-'Y' INDICATES WYE CONNECTION WITH GROUNDED NEUTRAL

THREE WINDING TRANSFORMER
-'W' INDICATES STRUCTURE DESIGNATION
-'XX' INDICATES POWER RATING (BY WINDING)
-'YY' INDICATES VOLTAGE RATING (BY WINDING)
-'Z' INDICATES IMPEDANCE (BY WINDING)
-'Δ' INDICATES DELTA CONNECTION
- ' ' INDICATES WYE CONNECTION
Y WITH GROUNDED NEUTRAL

TRANSFER SWITCH
- 'W' INDICATES
A: AUTOMATIC
M: MANUAL
- 'XX' INDICATES RATING IN AMPS
- 'Y' INDICATES NUMBER OF POLES

BYPASS ISOLATION TRANSFER SWITCH
-'XX' INDICATES AMPERE RATING
-'Y' INDICATES NUMBER OF POLES

ONE-LINE DIAGRAM

SWITCH
-'XX' INDICATES AMPERE RATING
-'Y' INDICATES NUMBER OF POLES

MEDIUM & HIGH VOLTAGE CIRCUIT BREAKER
- 'XX' INDICATES TRIP RATING IN AMPS
- 'YY' INDICATES FRAME RATING

LOW VOLTAGE MOLDED CASE CIRCUIT BREAKER.
- 'XX' INDICATES TRIP RATING IN AMPS (IF TRIP INTEGRAL)
- 'YY' INDICATES FRAME RATING, ID SPECIFIED
- 'W' INDICATES NUMBER OF POLES (3 UNLESS OTHERWISE NOTED)
- 'Z' DESIGNATES TYPE:
BLANK: THERMAL MAGNETIC
LSI: ELECTRONIC TRIP
MCP: MOTOR CIRCUIT PROTECTOR
GFI: GROUND FAULT INTERRUPTING

FUSE
- 'XX' INDICATES TRIP RATING IN AMPS
- 'Z' INDICATES CLASSIFICATION (IF SPECIFIED)

ANGLED BRACKETS INDICATE DRAWOUT DEVICE

PROTECTIVE RELAY, METERING, OR INTERLOCKING DEVICE.
'XX' DESIGNATIONS:
A: AMMETER
V: VOLTMETER
PF: POWER FACTOR
K: KIRK KEY INTERLOCK
I: ELECTRICAL INTERLOCK
ST: SHUNT TRIP
25: SYNCHRONISM CHECK
27: UNDER VOLTAGE
46: CURRENT UNBALANCE
47: PHASE-SEQUENCE VOLTAGE
50: INSTANTANEOUS OVERCURRENT
51: TIME OVERCURRENT
52: AC CIRCUIT BREAKER
55: POWER FACTOR
59: OVER VOLTAGE
64: GROUND PROTECTIVE RELAY
81: FREQUENCY
86: LOCKING OUT RELAY
* SPECIFIC MINIMUM FUNCTIONS TO BE LISTED BY ANSI/IEEE DEVICE NUMBERS

FULL VOLTAGE NON REVERSING CONTACTOR
'X' DESIGNATES NEMA SIZE OR:
BC: BYPASS CONTACTOR
OC: OUTPUT ISOLATION CONTACTOR
IC: INPUT ISOLATION CONTACTOR

LIGHTING CONTACTOR
-'XX' DESIGNATES AMPERE RATING
-'Y' DESIGNATES NUMBER OF POLES

LIGHTING CONTACTOR
-'XX' DESIGNATES AMPERE RATING
-'Y' DESIGNATES NUMBER OF POLES

MOTOR OVERLOAD.
RATED FOR DEVICE PROTECTING.
CLASS 20 UNLESS OTHERWISE INDICATED.
-'X' DESIGNATES TYPE:
T-THERMAL
E-ELECTRONIC.

FULL VOLTAGE REVERSING CONTACTOR
-'X' DESIGNATES NEMA SIZE.
-'F' INDICATES FORWARD CONTACTOR.
-'R' INDICATES REVERSING CONTACTOR.

TWO SPEED STARTER
-'X' DESIGNATES NEMA SIZE.
-'H' INDICATES HIGH SPEED CONTACTOR.
-'L' INDICATES LOW SPEED CONTACTOR.

REDUCED VOLTAGE AUTOTRANSFORMER
-'X' DESIGNATES NEMA SIZE.
-'Y' INDICATES TAP PERCENTAGE.

VARIABLE FREQUENCY DRIVE.
-'XX' INDICATES MINIMUM AMP RATING (IF NOT SPECIFIED, VFD TO MATCH HORSEPOWER RATING OF MOTOR SUPPLIED).

REDUCED VOLTAGE SOFT START.
-'XX' INDICATES MINIMUM AMP RATING (IF NOT SPECIFIED, RVSS TO MATCH HORSEPOWER RATING OF MOTOR SUPPLIED).

ONE-LINE DIAGRAM

NON-FUSED DISCONNECT SWITCH
- 'XX' DESIGNATES AMPERE RATING OF DISCONNECT.
- 'Y' DESIGNATES NUMBER OF POLES

FUSED DISCONNECT SWITCH
- 'XX' DESIGNATES AMPERE RATING OF FUSE. DISCONNECT AMPERE RATING TO BE EQUAL TO FUSE RATING OR THE NEXT LARGEST TRADE SIZE.
- 'Y' DESIGNATES NUMBER OF POLES

INDUCTION MOTOR
-'WW' INDICATES EQUIPMENT DESIGNATION.
-'XX' INDICATES HORSEPOWER RATING.

SYNCHRONOUS MOTOR
-'WW' INDICATES EQUIPMENT DESIGNATION.
-'XX' INDICATES HORSEPOWER RATING.

PANELBOARD
- 'X' INDICATES STRUCTURE DESIGNATION.

UPS — UNINTERRUPTIBLE POWER SUPPLY.

SPD — SURGE SUPPRESSION DEVICE.

LIGHTNING ARRESTORS
- 'XX' INDICATES
IC: INTERMEDIATE CLASS
DC: DISTRIBUTION CLASS
SC: STATION CLASS

EARTH GROUND

LINE OR LOAD REACTOR.
'Z' DESIGNATES % IMPEDANCE.

CAPACITOR
- 'XX' INDICATES kVAR RATING

RESISTOR
- 'ZZ' INDICATES IMPEDANCE IN OHMS

MISCELLANEOUS ELECTRICAL EQUIPMENT, SUCH AS PANEL, ETC. EQUIPMENT TYPE AND RATINGS TO BE INDICATED.

ELECTRICAL EQUIPMENT BOUNDARY. INDICATES MULTIPLE DEVICES ENCLOSED WITHIN BORDER ARE LOCATED WITHIN THE SAME ENCLOSURE, OR MOUNTED TO SAME PANEL RACK.

PORTABLE POWER CONNECTION
-'XX' INDICATES AMPERE RATING
-'Y' DESIGNATES TYPE:
3: 3 WIRE + GROUND
4: 4 WIRE + GROUND

ELEMENTARY WIRING SCHEMATICS

PRESSURE SWITCH - NORMALLY OPEN.

PRESSURE SWITCH - NORMALLY CLOSED.

DIFFERENTIAL PRESSURE SWITCH - NORMALLY OPEN.

DIFFERENTIAL PRESSURE SWITCH - NORMALLY CLOSED.

TIME DELAY SWITCH - TIMER ON DELAY (CLOSES AFTER TIMER EXPIRES).

TIMER DELAY SWITCH - TIMER OFF DELAY (OPENS AFTER TIMER EXPIRES).

VIBRATION SWITCH - NORMALLY OPEN

VIBRATION SWITCH - NORMALLY CLOSED

PANEL MOUNTED INDICATOR LIGHT
"X" INDICATES COLOR:
A - AMBER
G - GREEN
R - RED
W - WHITE
B - BLUE

ELEMENTARY WIRING SCHEMATICS

COIL CONTACTS.
VOLTAGE AS INDICATED ON SCHEMATICS
"X" DESIGNATES:
C - CONTROL RELAY
LC - LIGHTING CONTACTOR
M - MOTOR CONTACTOR
T - TIME DELAY RELAY

SOLENOID COIL.

NORMALLY OPEN CONTACT.

NORMALLY CLOSED CONTACT.

LIMIT SWITCH - NORMALLY OPEN.

LIMIT SWITCH - NORMALLY CLOSED.

LIMIT SWITCH - NORMALLY OPEN, HELD CLOSED.

LIMIT SWITCH - NORMALLY CLOSED, HELD OPEN.

LIQUID LEVEL (FLOAT) SWITCH - NORMALLY OPEN.

LIQUID LEVEL (FLOAT) SWITCH - NORMALLY CLOSED.

FLOW SWITCH - NORMALLY OPEN.

FLOW SWITCH - NORMALLY CLOSED.

TEMPERATURE SWITCH - NORMALLY OPEN.

TEMPERATURE SWITCH - NORMALLY CLOSED.

TERMINAL BLOCK.
"X" INDICATES TERMINAL NUMBER.
"#" INDICATES TERMINAL BLOCK NUMBER

EXTERNALLY MOUNTED DEVICE.
DASHED LINE INDICATES WIRING EXTERNAL TO PANEL.

SELECTOR SWITCH.
"X" INDICATES SWITCH POSITION.
TOTAL DIGITS PER LINE INDICATES NUMBER OF SWITCH POSITIONS (THREE SHOWN).

MOMENTARY PUSH BUTTON - NORMALLY OPEN

MOMENTARY PUSH BUTTON - NORMALLY CLOSED

REMOTE SHUTDOWN/STOP - NORMALLY CLOSED

KEY SWITCH

NON RESETTABLE RUN TIME METER.

BATTERY - VOLUME AND AMP HOURS AS INDICATED.

FULL WAVE RECTIFIER.

HORN ELEMENT.

EXTERNALLY MOUNTED ALARM LIGHT.

PHOTOCELL.

PANEL MOUNTED INDICATOR LIGHT
'PUSH TO TEST' TYPE.
"X" INDICATES COLOR:
A - AMBER
G - GREEN
R - RED
W - WHITE
B - BLUE

NO.	BY	DATE	SYMBOL	REVISIONS
6.				
5.				
4.				
3.				
2.				
1.				

MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	L.BURNSIDE
DRAWN BY:	W.HILL
DATE:	JUNE 2026
CHECKED BY:	T.PRICE
DATE:	JUNE 2026

DESIGN ENGINEER
ANTONIO GONZALEZ JR., P.E.
FLORIDA REGISTRATION NO.
86300

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

ELECTRICAL LEGEND, ABBREVIATIONS AND NOTES

SHEET NO. 49
DWG NO. E-0.1
100% SUBMITTAL

Xrefs Attached= SJCUD_22X34_BOR-E [C:\Users\Hau102392\DC\ACCDocs\Mott MacDonald\502101130-015 - SJCUD - North Beach WTP\Project Files\MottMac\E_Electrical Engineering\Xrefs\SJCUD_22X34_BOR-E.dwg]
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LIGHTING

XX — CEILING MOUNTED FIXTURE.
'XX' DESIGNATES FIXTURE TYPE AS SPECIFIED ON LIGHTING FIXTURE SCHEDULE.

XX — FIXTURE PROVIDING EMERGENCY ILLUMINATION.
'XX' DESIGNATES FIXTURE TYPE AS SPECIFIED ON LIGHTING FIXTURE SCHEDULE.

XX — CEILING MOUNTED DOWNLIGHTING FIXTURE.
'XX' DESIGNATES FIXTURE TYPE AS SPECIFIED ON LIGHTING FIXTURE SCHEDULE.

XX — SURFACE MOUNT OR SUSPENDED FIXTURE
INDUSTRIAL STRIP TYPE FIXTURE
XX' DESIGNATES FIXTURE TYPE AS SPECIFIED ON LIGHTING FIXTURE SCHEDULE.

XX XX — WALL MOUNTED FIXTURE.
'XX' DESIGNATES FIXTURE TYPE AS SPECIFIED ON LIGHTING FIXTURE SCHEDULE.

XX — TRACK LIGHTING. LENGTH AND NUMBER OF FIXTURES AS INDICATED ON PLANS..
'XX' DESIGNATES FIXTURE TYPE AS SPECIFIED ON LIGHTING FIXTURE SCHEDULE.

XX — TWIN HEAD EMERGENCY BATTERY UNIT.
'XX' DESIGNATES FIXTURE TYPE AS SPECIFIED ON LIGHTING FIXTURE SCHEDULE.

XX — CEILING MOUNTED REMOTE BATTERY HEADS.
AIMING AS INDICATED.
'XX' DESIGNATES FIXTURE TYPE AS SPECIFIED ON LIGHTING FIXTURE SCHEDULE.

XX — WALL MOUNTED REMOTE BATTERY HEADS.
AIMING AS INDICATED.
'XX' DESIGNATES FIXTURE TYPE AS SPECIFIED ON LIGHTING FIXTURE SCHEDULE.

XX — EXIT SIGN; CEILING MOUNTED; ARROWS AS INDICATED.
'XX' DESIGNATES FIXTURE TYPE AS SPECIFIED ON LIGHTING FIXTURE SCHEDULE.

XX — EXIT SIGN; WALL MOUNTED; ARROWS AS INDICATED.
'XX' DESIGNATES FIXTURE TYPE AS SPECIFIED ON LIGHTING FIXTURE SCHEDULE.

EXIT SIGN WITH EMERGENCY HEADS; ARROWS AS INDICATED.
'XX' DESIGNATES FIXTURE TYPE AS SPECIFIED ON LIGHTING FIXTURE SCHEDULE.

XX XX — POLE MOUNTED LIGHT FIXTURE.
'XX' DESIGNATES FIXTURE TYPE AS SPECIFIED ON LIGHTING FIXTURE SCHEDULE. ONLY SINGLE FIXTURE SHOWN.

$XX — WALL SWITCH.
'XX' DESIGNATES:
- NO SUBSCRIPT DENOTES SINGLE POLE
- 3 - 3 WAY SWITCH
- 4 - 4 WAY SWITCH
- D - DIMMER
- K - KEY OPERATED
- L - WITH PILOT LIGHT
- M - MOTOR RATED
- O - OCCUPANCY MOTION SENSOR W/OVERRIDE
- T - TIMER
- AS - DENOTES OCCUPANCY OVERRIDE
- CR - CORROSION RESISTANT
- EP - EXPLOSION PROOF
- TS - TIME SWITCH
- WP - WEATHERPROOF

LC — LIGHTING CONTROL POWER PACK

X — CEILING MOUNTED SENSOR.
'X' DESIGNATES SENSOR AS SPECIFIED IN THE SENSOR SCHEDULE.

X — WALL MOUNTED OCCUPANCY SENSOR.
'X' DESIGNATES SENSOR AS SPECIFIED IN THE SENSOR SCHEDULE.

ALL DEVICES/PLATES TO BE IN OWNERS CHOICE OF COLORS.

GENERAL

LINETYPE FOR FUTURE WORK

RACEWAYS

OVERHEAD ELECTRICAL

CONDUIT RUN CONCEALED ABOVE CEILING OR IN WALLS

CONDUIT RUN BELOW GRADE OR IN SLAB

CONDUIT RUN EXPOSED PARALLEL OR PERPENDICULAR TO BUILDING LINES

HOMERUN TO PANELBOARD ANY CIRCUIT WITHOUT FURTHER DESIGNATION 2#12, 1#12 GRD. MINIMUM CONDUIT SIZE SHALL BE 3/4"

FLEXIBLE CONDUIT

CONDUIT TURNING DOWN

CONDUIT TURNING UP

CONDUIT CAPPED

EXPLOSIONPROOF CONDUIT SEAL

CONDUIT EXPANSION FITTING

HH — HAND HOLE (DRAWN TO SCALE ON PLANS)

MH — MAN HOLE (DRAWN TO SCALE ON PLANS)

PB — PULL BOX (DRAWN TO SCALE ON PLANS)

CABLE TRAY (DRAWN TO SCALE ON PLANS)

W-XXXX-YY — CABLE/CONDUIT TAG.
DESIGNATIONS:
FOR 'W': H - POWER (>5kVAC)
M - POWER (601-4999VAC)
P - POWER (241-600VAC)
L - POWER (51-240VAC)
D - DC POWER
C - CONTROL
I - NETWORK
E - EMERGENCY SHUT DOWN
F - FIBER OPTIC COMMUNICATIONS
O - OTHER COMMUNICATIONS

FOR 'XXXX': EQUIPMENT REFERENCE

FOR 'YY': ALPHANUMERIC SUFFIX AS NEEDED

CONCRETE ENCASED

GROUNDING & LIGHTNING PROTECTION

CONNECTION TO GROUND GRID. MECHANICAL OR CADWELD CONNECTION AS NOTED.

GROUND ROD.

GROUND TEST STATION.

GROUND ANODE.

VEHICLE GROUNDING STATION.

G — G — GROUNDING GRID OR COUNTERPOISE SYSTEM CONDUCTOR.

LIGHTING PROTECTION AIR TERMINAL.

LIGHTNING PROTECTION DISSIPATION AIR TERMINAL.

L — L — LIGHTNING PROTECTION SYSTEM CONDUCTOR.

LIGHTNING PROTECTION SYSTEM DOWN CONDUCTOR.

OUTLETS AND RECEPTACLES

XX — DUPLEX RECEPTACLE, MOUNT 18" AFF UNLESS OTHERWISE NOTED.

XX — QUADPLEX RECEPTACLE, MOUNT 18" AFF UNLESS OTHERWISE NOTED.

XX — SINGLE OUTLET RECEPTACLE, MOUNT 18" AFF UNLESS OTHERWISE NOTED.

XX — SPECIAL PURPOSE RECEPTACLE, MOUNT 18" AFF UNLESS OTHERWISE NOTED.

FOR ALL RECEPTACLES, 'XX' DESIGNATES:
- AC - INSTALL 6" ABOVE COUNTER / BACKSPLASH (GFI REQUIRED).
- CLG - CEILING MOUNT
- CR - CORROSION RESISTANT
- EP - EXPLOSION PROOF
- GF - GROUND FAULT
- WP - WEATHERPROOF

MULTI-RECEPTACLE ASSEMBLY WITH RECEPTACLES AS INDICATED.

J — JUNCTION BOX

FLOOR MOUNTED DUPLEX RECEPTACLE.

FLOOR MOUNTED BOX POWER AND TELCOM RECEPTACLES.

ALL DEVICES/PLATES TO BE IN OWNERS CHOICE OF COLORS.

COMMUNICATIONS

WALL MOUNTED DATA OUTLET. 18" AFF UNLESS OTHERWISE NOTED.

X — FLOOR MOUNTED DATA OUTLET.
'X' DESIGNATES:
- F - FLUSH
- S - SURFACE

WALL MOUNTED TELEPHONE OUTLET. 18" AFF UNLESS OTHERWISE NOTED.

X — FLOOR MOUNTED TELEPHONE OUTLET.
'X' DESIGNATES:
- F - FLUSH
- S - SURFACE

WALL MOUNTED TELEPHONE/DATA COMBINATION OUTLET. 18" AFF UNLESS OTHERWISE NOTED.

X — FLOOR MOUNTED TELEPHONE/DATA COMBINATION OUTLET.
'X' DESIGNATES:
- F - FLUSH
- S - SURFACE

B — BLUE INDICATOR LIGHT FOR EMERGENCY CALL BOX.

C — EMERGENCY CALL BOX.

L — LANE USE SIGNAL. 18" X 18" LED TYPE WITH GREEN "↓" AND RED "X".

HVAC

T — THERMOSTAT

R — AMBIENT TEMPERATURE TRANSMITTER

UNIT HEATER

LOSS OF VENTILATION WARNING DEVICE.

AFS — AFS

MD — MOTORIZED DAMPER

FIRE ALARM

EVAC — VOICE EVACUATION PANEL

FAA — FIRE ALARM ANNUNCIATOR PANEL

FACP — FIRE ALARM CONTROL PANEL

F — FIRE ALARM MANUAL PULL STATION

S — FIRE ALARM SMOKE DETECTOR

H — HEAT DETECTOR

SD — FIRE ALARM DUCT SMOKE DETECTOR

FIRE ALARM STROBE LIGHT W/ BUZZER WALL MOUNTED

F — FIRE ALARM SPEAKER/STROBE LIGHT COMBINATION WALL MOUNTED

H — HORN UNIT ONLY

ST FA — FIRE ALARM STROBE CEILING MOUNTED

R — FIRE ALARM RELAY

FE — FIRE EXTINGUISHER.

FS — FIRE ALARM FLOW SWITCH

PS — LOW PRESSURE SWITCH

TS — FIRE ALARM TAMPER SWITCH

TB — FIRE ALARM TELEPHONE BASE

SP WP — MASS NOTIFICATION SPEAKER/STROBE LIGHT COMBINATION (WEATHER PROOF) WALL MOUNTED

SPT — MASS NOTIFICATION SPEAKER/STROBE COMBINATION CEILING MOUNTED

SP — MASS NOTIFICATION SPEAKER CEILING MOUNTED

SECURITY

GENERAL DEVICE ARRANGEMENT

M T (SPECIFIC TO DEVICE)

M: P - PEDESTAL, M- MULLION, T - TURNSTILE, D - DESK, S - SURFACE, W - WALL, F - FLUSH, C - CEILING, R - RACK, H - HIDDEN

ACCESS CONTROL

M T — CARD ACCESS READER
- B - BARCODE
- W - WIEGAND
- P - PROXIMITY
- M - MAG STRIPE
- F - ELEVATOR FLOOR CALL
- H - ELEVATOR HALL CALL
- T - TOKEN
- S - SMART CARD

M T — BIOMETRICS ACCESS CONTROL DEVICE
- H - HAND GEOMETRY
- F - FINGER PRINT
- V - VOICE
- R - EYE RETINA
- I - EYE IRIS

M — KEYPAD DEVICE

M T — CARD READER WITH KEYPAD
S - SMART CARD

M — CARD READER WITH TIME AND ATTENDANCE

M T — AUTO MONITORING SWITCH

ANNUNCIATION DEVICES

M T — AUDIO DEVICE
T: Z - BUZZER, B - BELL, C - CHIME, H - HORN, S - SPEAKER, L - LISTEN-IN, K - KLAXON, M - MICROPHONE, S - SOUNDER

MISCELLANEOUS

M T — MOTION DETECTOR
T: M - MICROWAVE, IR - INFRARED, U - ULTRASONIC, X - REQUEST-FOR-EXIT, D - DUAL TECHNOLOGY

F M T — BI-STATIC BEAM SENSOR F: TX - TRANSMIT, RX - RECEIVE
T: M - MICROWAVE, IR - INFRARED

X M T — CCTV CAMERA. MOUNTING AS INDICATED ON PLANS.
'X' DESIGNATES:
- F - FIXED TYPE
- PTZ - PAN TILT ZOOM

T: S - SCOOP/WEDGE, B - BOARD, C - CORNER, E - ENVIRONMENTAL, D - DOME

ALARM LIGHT

DOOR AND LOCKING HARDWARE

M T — ELECTRONIC LOCK
M - MAGNETIC, IR - INFRARED, H - HYBRID, S - STRIKE, D - DEADBOLT, L - LATCH SET

NO.	BY	DATE	SYMBOL	REVISIONS
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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	L.BURNSIDE
DRAWN BY:	W.HILL
DATE:	JUNE 2026
CHECKED BY:	T.PRICE
DATE:	JUNE 2026

DESIGN ENGINEER
ANTONIO GONZALEZ JR., P.E.
FLORIDA REGISTRATION NO.
86300

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

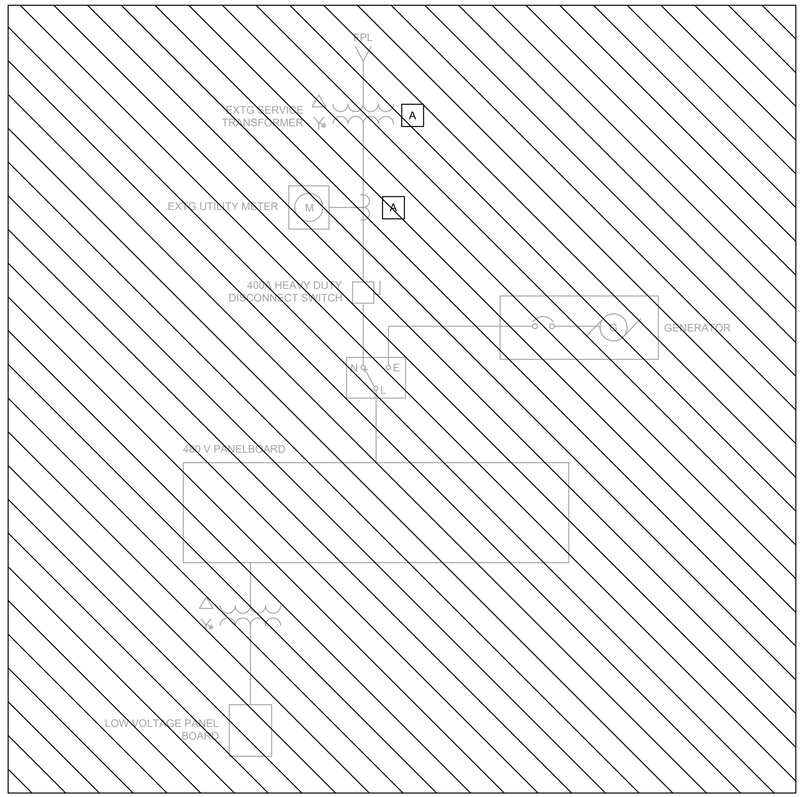
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

ELECTRICAL LEGEND, ABBREVIATIONS AND NOTES

SHEET NO. 50
DWG NO. E-0.2
100% SUBMITTAL

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EXISTING/DEMO ONELINE
NO SCALE

GENERAL NOTES

1. ONE-LINE DRAWINGS DEPICTED ARE BASED ON ENGINEERING REPRESENTATIVES FIELD INVESTIGATION. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO FIELD VERIFY CONNECTED EQUIPMENT AND COORDINATE WITH THE OWNER PRIOR TO DEMOLITION.
2. PLANT OUTAGES SHALL BE KEPT TO A MINIMUM AND ALL PLANT OUTAGES SHALL BE COORDINATED WITH THE OWNER AND ENGINEER.

[-] KEY NOTES

A. CONTRACTOR SHALL COORDINATE WITH FPL REGARDING THE DISCONNECTION, REMOVAL, AND HANDLING OF THE EXISTING UTILITY TRANSFORMER AND METER.

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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	L.BURNSIDE
DRAWN BY:	W.HILL
DATE:	JUNE 2026
CHECKED BY:	T.PRICE
DATE:	JUNE 2026

DESIGN ENGINEER
ANTONIO GONZALEZ JR., P.E.
FLORIDA REGISTRATION NO.
86300

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

EXISTING/DEMO ONE-LINE DIAGRAM

SHEET NO. 51
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GENERAL NOTES

1. CONTRACTOR SHALL COORDINATE WITH FPL FOR ALL ELECTRICAL SERVICE INSTALLATION REQUIREMENTS, INCLUDING THE SERVICE TRANSFORMER, TRANSFORMER PAD, METERING, AND ALL ASSOCIATED EQUIPMENT. CONTRACTOR IS RESPONSIBLE FOR PURCHASING, FURNISHING, AND INSTALLING ALL FPL REQUIRED EQUIPMENT AND SHALL COVER ALL COSTS FOR SERVICE APPLICATIONS, INSTALLATION FEES, EQUIPMENT, AND ANY ADDITIONAL CHARGES REQUIRED BY FPL TO ESTABLISH SERVICE.
2. SCCA CALCULATIONS ARE PRELIMINARY AND WILL BE UPDATED AFTER THE INCOMING SERVICE DESIGN IS FINALIZED BY FPL.
3. EXISTING EQUIPMENT IS BASED UPON AS-BUILT DATA AND THE ENGINEER CANNOT GUARANTEE ITS ACCURACY. CONTRACTOR SHALL VERIFY EXISTING EQUIPMENT FOR RE-TERMINATION.

[-] KEY NOTES

A. HARMONIC FILTER PER RESULTS OF HARMONIC SYSTEM STUDY BY MFR. SEE SPECIFICATIONS.

B. EQUIPMENT EXISTING TO BE RELOCATED.

C. PROVISIONS WITHIN MCC SHALL BE INCLUDED FOR FUTURE UPGRADES.

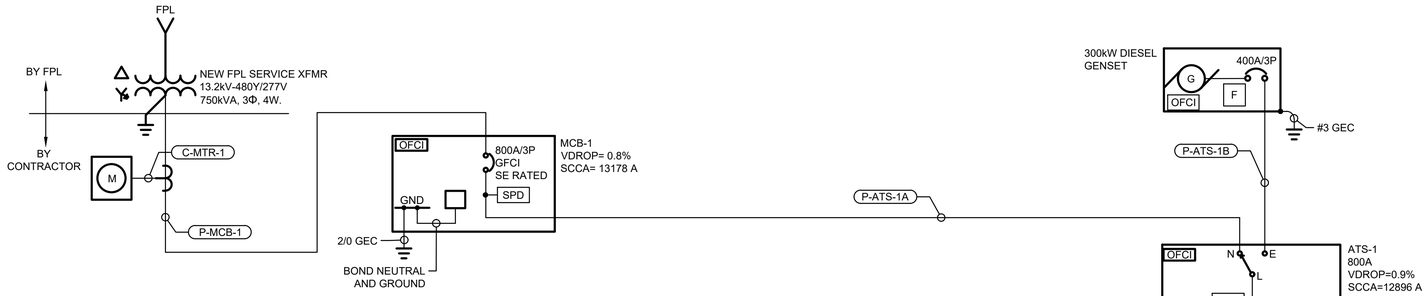
D. IF THE BASE BID IS EXECUTED, THE MCC SHALL INCLUDE ALL PROVISIONS NECESSARY TO SUPPORT THE FUTURE INSTALLATION OF THE BID ALTERNATE EQUIPMENT.

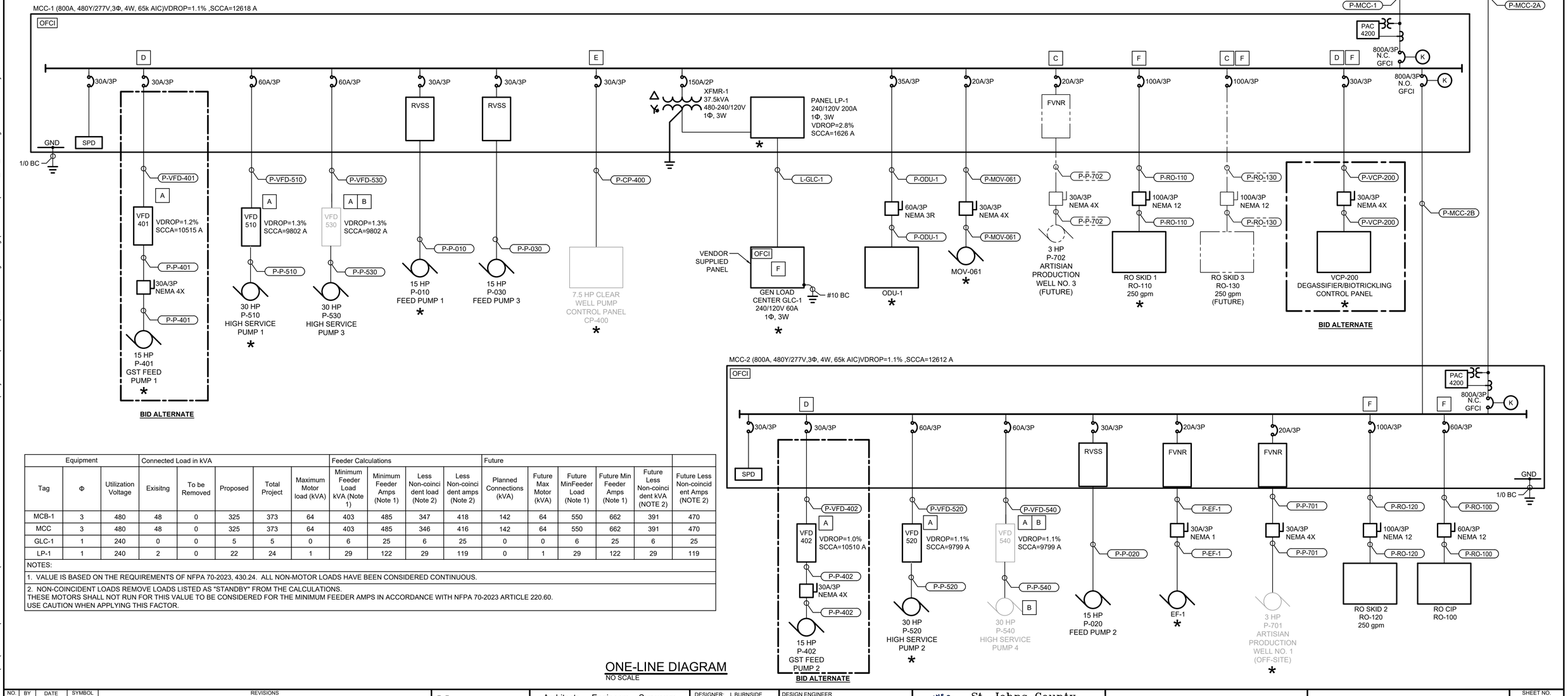
E. IF THE BID ALTERNATE IS EXECUTED, THE CONTRACTOR SHALL DEMOLISH THE EXISTING CLEAR WELL PUMP CONTROL PANEL AND PUMP. THE CIRCUIT BREAKER SHOWN FEEDING THE CLEAR WELL PUMP SHALL BE PROVIDED AND INSTALLED AS A SPARE BREAKER.

F. FINAL OCPD RATING SHALL BE COORDINATED WITH THE EQUIPMENT SUPPLIER.

OFCI INDICATES OWNER FURNISHED CONTRACTOR INSTALL EQUIPMENT

* INDICATES EQUIPMENT DESIGNED TO OPERATE ON EMERGENCY GENERATOR





Equipment			Connected Load in kVA					Feeder Calculations				Future					
Tag	Φ	Utilization Voltage	Exisitng	To be Removed	Proposed	Total Project	Maximum Motor load (kVA)	Minimum Feeder Load kVA (Note 1)	Minimum Feeder Amps (Note 1)	Less Non-coincident load (Note 2)	Less Non-coincident amps (Note 2)	Planned Connections (kVA)	Future Max Motor (kVA)	Future MinFeeder Load (Note 1)	Future Min Feeder Amps (Note 1)	Future Less Non-coincident kVA (NOTE 2)	Future Less Non-coincident Amps (NOTE 2)
MCB-1	3	480	48	0	325	373	64	403	485	347	418	142	64	550	662	391	470
MCC	3	480	48	0	325	373	64	403	485	346	416	142	64	550	662	391	470
GLC-1	1	240	0	0	5	5	0	6	25	6	25	0	0	6	25	6	25
LP-1	1	240	2	0	22	24	1	29	122	29	119	0	1	29	122	29	119
NOTES:																	
1. VALUE IS BASED ON THE REQUIREMENTS OF NFPA 70-2023, 430.24. ALL NON-MOTOR LOADS HAVE BEEN CONSIDERED CONTINUOUS.																	
2. NON-COINCIDENT LOADS REMOVE LOADS LISTED AS "STANDBY" FROM THE CALCULATIONS. THESE MOTORS SHALL NOT RUN FOR THIS VALUE TO BE CONSIDERED FOR THE MINIMUM FEEDER AMPS IN ACCORDANCE WITH NFPA 70-2023 ARTICLE 220.60. USE CAUTION WHEN APPLYING THIS FACTOR.																	

ONE-LINE DIAGRAM
NO SCALE

NO.	BY	DATE	SYMBOL	REVISIONS
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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	L.BURNSIDE
DRAWN BY:	W.HILL
DATE:	JUNE 2026
CHECKED BY:	T.PRICE
DATE:	JUNE 2026

DESIGN ENGINEER
ANTONIO GONZALEZ JR., P.E.
FLORIDA REGISTRATION NO.
86300

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

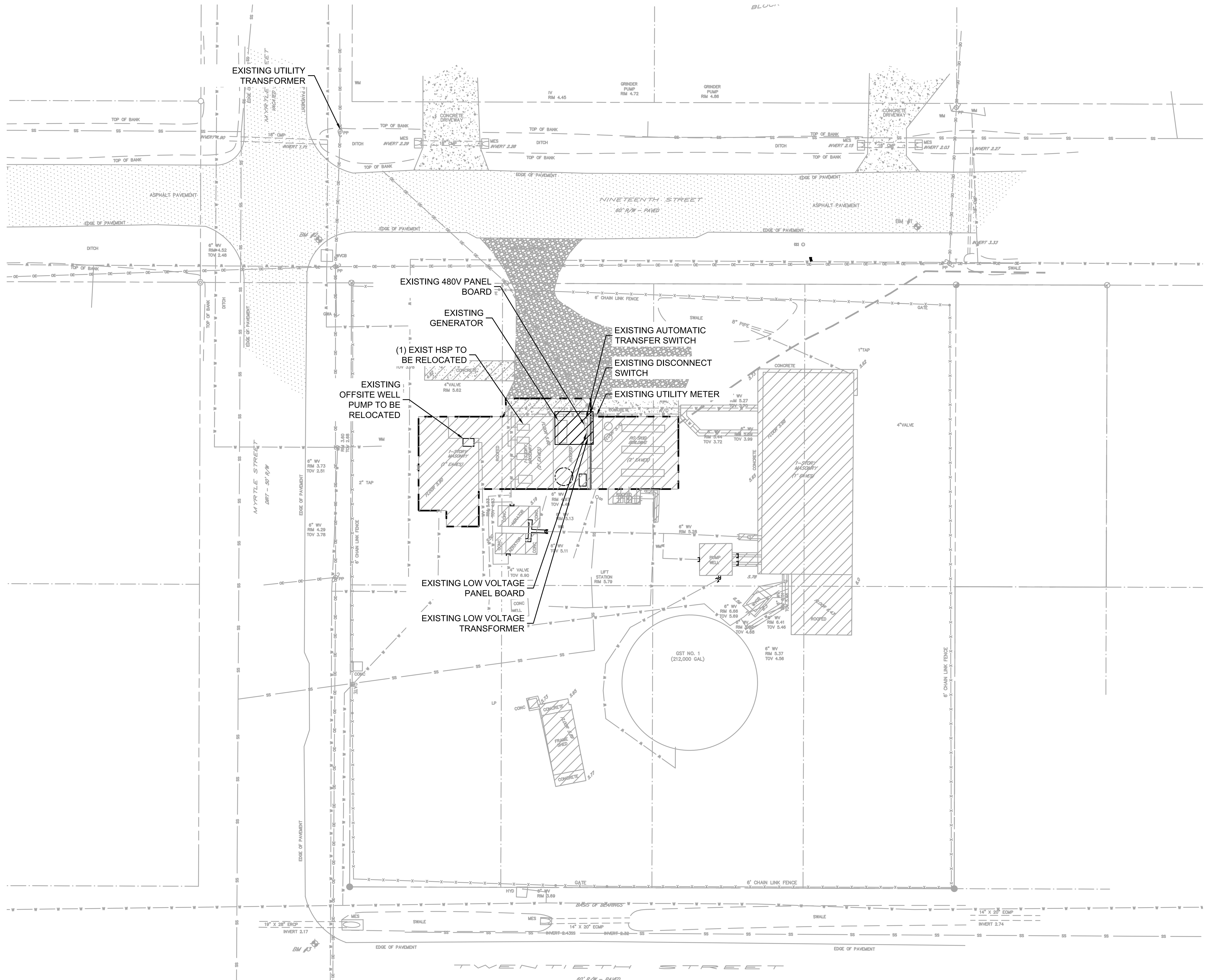
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

PROPOSED ONE-LINE DIAGRAM

SHEET NO. 52
DWG NO. E-1.2
100% SUBMITTAL

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GENERAL NOTES

1. CONTRACTOR SHALL COORDINATE WITH FPL REGARDING THE DISCONNECTION, REMOVAL, AND HANDLING OF THE EXISTING UTILITY TRANSFORMER, METER, AND OVERHEAD SERVICE.
2. CONTRACTOR WILL BE RESPONSIBLE FOR ANY DEMOLITION AND REMOVAL WORK REQUIRED BY FPL. ALL COST ASSOCIATED WITH EQUIPMENT REMOVAL AND ANY ADDITIONAL CHARGES REQUIRED BY FPL SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

EXISTING ELECTRICAL SITE AND DEMOLITION PLAN

0 10 20
SCALE: 1" = 10'

NO.	BY	DATE	SYMBOL	REVISIONS
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MOTT MACDONALD
Mott MacDonald Florida, LLC
Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	L.BURNSIDE
DRAWN BY:	W.HILL
DATE:	JUNE 2026
CHECKED BY:	T.PRICE
DATE:	JUNE 2026

DESIGN ENGINEER
ANTONIO GONZALEZ JR., P.E.
FLORIDA REGISTRATION NO.
86300

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

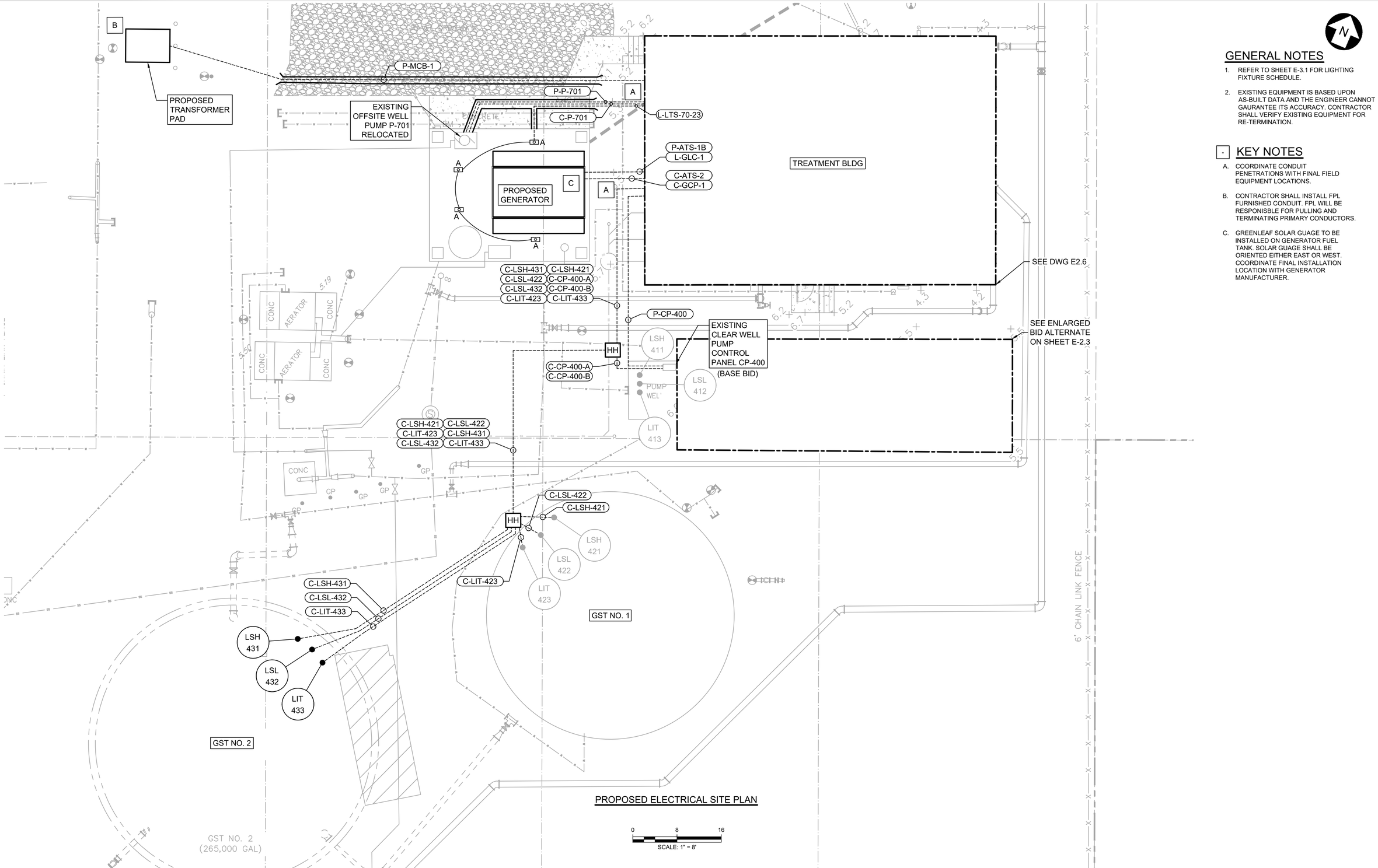
NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

EXISTING ELECTRICAL SITE AND DEMOLTION PLAN

SHEET NO. 53
DWG NO. E-2.1
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GENERAL NOTES

1. REFER TO SHEET E-3.1 FOR LIGHTING FIXTURE SCHEDULE.
2. EXISTING EQUIPMENT IS BASED UPON AS-BUILT DATA AND THE ENGINEER CANNOT GAURANTEE ITS ACCURACY. CONTRACTOR SHALL VERIFY EXISTING EQUIPMENT FOR RE-TERMINATION.

KEY NOTES

A. COORDINATE CONDUIT PENETRATIONS WITH FINAL FIELD EQUIPMENT LOCATIONS.

B. CONTRACTOR SHALL INSTALL FPL FURNISHED CONDUIT. FPL WILL BE RESPONISBLE FOR PULLING AND TERMINATING PRIMARY CONDUCTORS.

C. GREENLEAF SOLAR GUAGE TO BE INSTALLED ON GENERATOR FUEL TANK. SOLAR GUAGE SHALL BE ORIENTED EITHER EAST OR WEST. COORDINATE FINAL INSTALLATION LOCATION WITH GENERATOR MANUFACTURER.

PROPOSED ELECTRICAL SITE PLAN

0 8 16
SCALE: 1" = 8'

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Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	L.BURNSIDE
DRAWN BY:	W.HILL
DATE:	JUNE 2026
CHECKED BY:	T.PRICE
DATE:	JUNE 2026

DESIGN ENGINEER
ANTONIO GONZALEZ JR., P.E.
FLORIDA REGISTRATION NO.
86300

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

PROPOSED ELECTRICAL SITE PLAN

SHEET NO. 54
DWG NO. E-2.2
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GENERAL NOTES

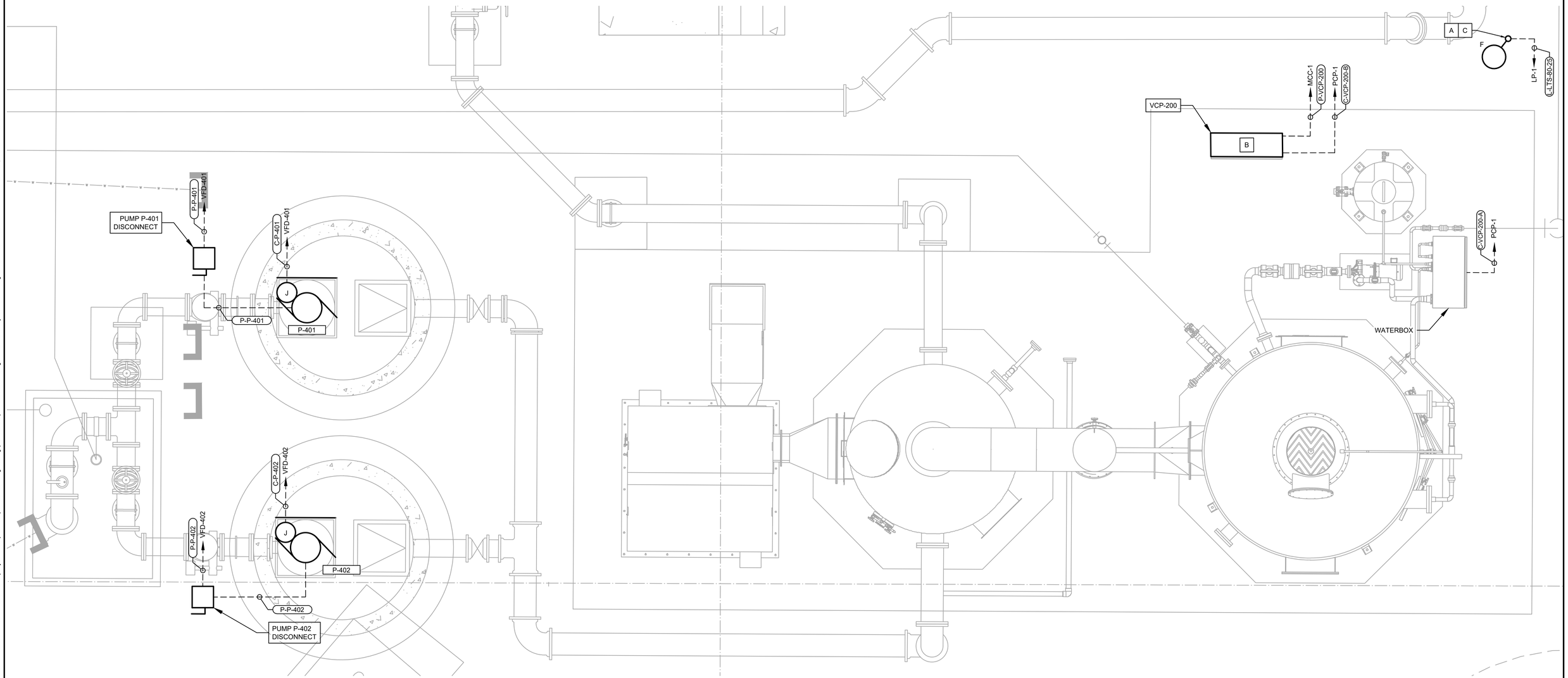
1. REFER TO SHEET E-3.1 FOR LIGHTING FIXTURE SCHEDULE

KEY NOTES

A. INSTALL LIGHT POLE IN ACCORDANCE WITH "WORK LIGHT DETAIL".

B. CONTROL PANEL LOCATION AND SIZE IS APPROXIMATE. CONTRACTOR SHALL COORDINATE FINAL LOCATION AND SIZE WITH THE EQUIPMENT VENDOR.

C. LIGHT POLE SHALL BE INSTALLED WITH THE SAME RELATIVE DISTANCE AND ORIENTATION TO THE FINAL CONTROL PANEL LOCATION AS SHOWN.



DEGASSIFIER/BIOTRICKLING FILTER ELECTRICAL PLAN (BID ALTERNATE)

0 2 4

SCALE: 1" = 2'

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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	L.BURNSIDE
DRAWN BY:	W.HILL
DATE:	JUNE 2026
CHECKED BY:	T.PRICE
DATE:	JUNE 2026

DESIGN ENGINEER
ANTONIO GONZALEZ JR., P.E.
FLORIDA REGISTRATION NO.
86300

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

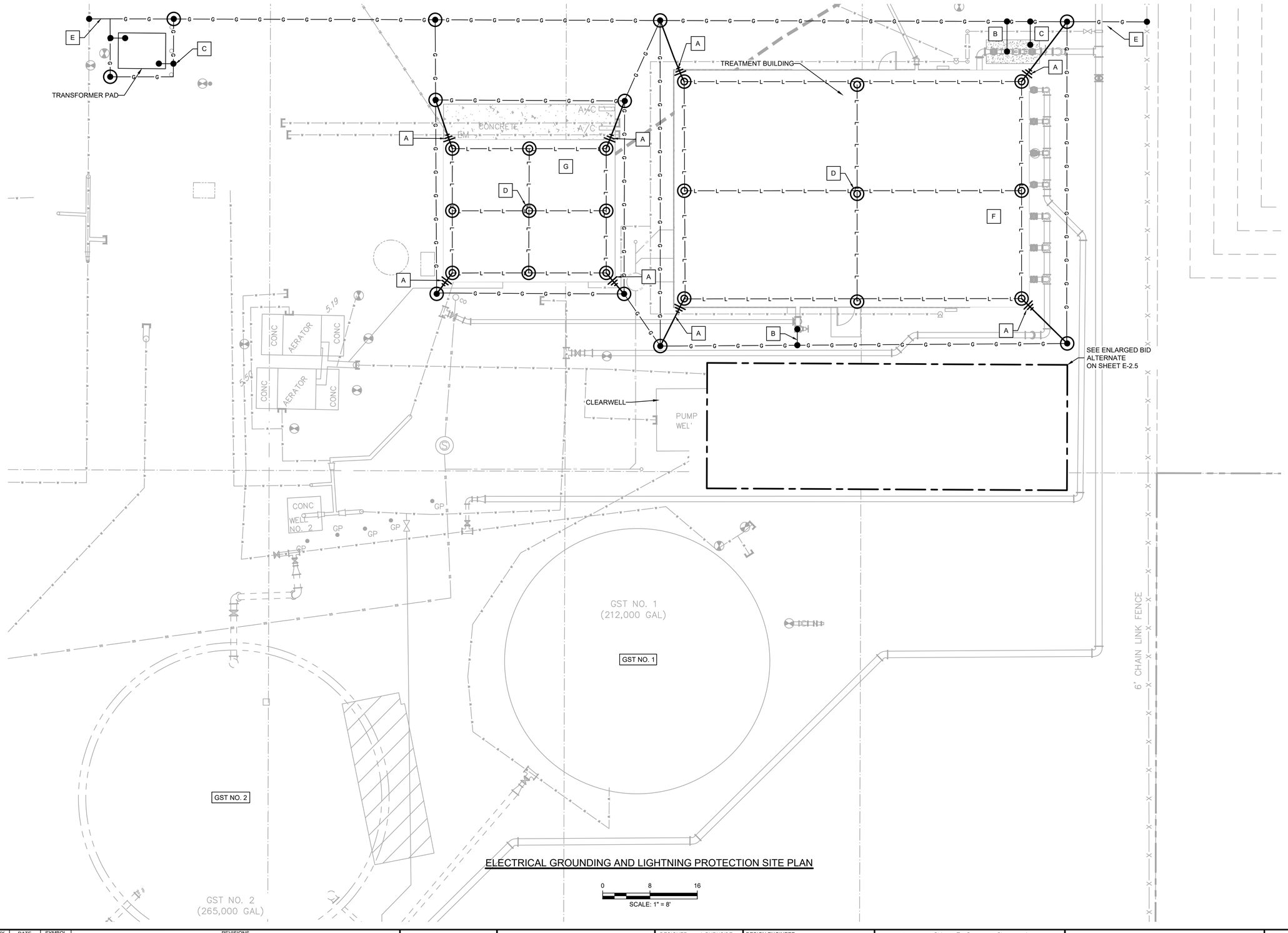
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

DEGASSIFIER/BIOTRICKLING
FILTER ELECTRICAL
PLAN
(BID ALTERNATIVE)

SHEET NO. 55
DWG NO. E-2.3
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Current Layout Tab = Degassifier Filter Elec Plan Thu Jun 04, 2026 - 10:40
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GENERAL NOTES

1. CONTRACTOR SHALL ENSURE ELECTRICAL GEAR CONNECTED TO GROUNDING GRID BY CHECKING AT MULTIPLE POINTS THROUGHOUT GROUNDING SYSTEM TO VERIFY PROPER RESISTANCE. GROUNDING TO BE ACCOMPLISHED BY THIRD PARTY CONTRACTOR CERTIFIED TO PERFORM GROUNDING TEST.
2. REFER TO GROUNDING DETAILS AND LIGHTNING PROTECTION DETAILS.

- KEY NOTES

A. LIGHTNING PROTECTION DOWNCOMER IN PVC CONDUIT TO MATCH INSTALLATION SURFACE.

B. BOND PIPE TO GROUND GRID.

C. BOND REBAR TO GROUND GRID.

D. INSTALL AIR TERMINAL TYPICAL.

E. EXTEND GROUND GRID TO PROPOSED FENCELINE IN (4) LOCATIONS.

F. BOND METALLIC STAIRS, ELECTRICAL EQUIPMENT AND REBAR LOCATED BELOW THE PUMP CANOPY TO GROUND GRID.

G. BOND METALLIC STAIRS, ELECTRICAL EQUIPMENT, PIPING, AND REBAR LOCATED BELOW THE GENERATOR CANOPY TO THE GROUND GRID.

ELECTRICAL GROUNDING AND LIGHTNING PROTECTION SITE PLAN

0 8 16

SCALE: 1" = 8"

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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	L.BURNSIDE
DRAWN BY:	W.HILL
DATE:	JUNE 2026
CHECKED BY:	T.PRICE
DATE:	JUNE 2026

DESIGN ENGINEER
ANTONIO GONZALEZ JR., P.E.
FLORIDA REGISTRATION NO.
86300

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

GROUNDING AND
LIGHTNING
PROTECTION SITE
PLAN

SHEET NO. 56
DWG NO. E-2.4
100% SUBMITTAL

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GENERAL NOTES

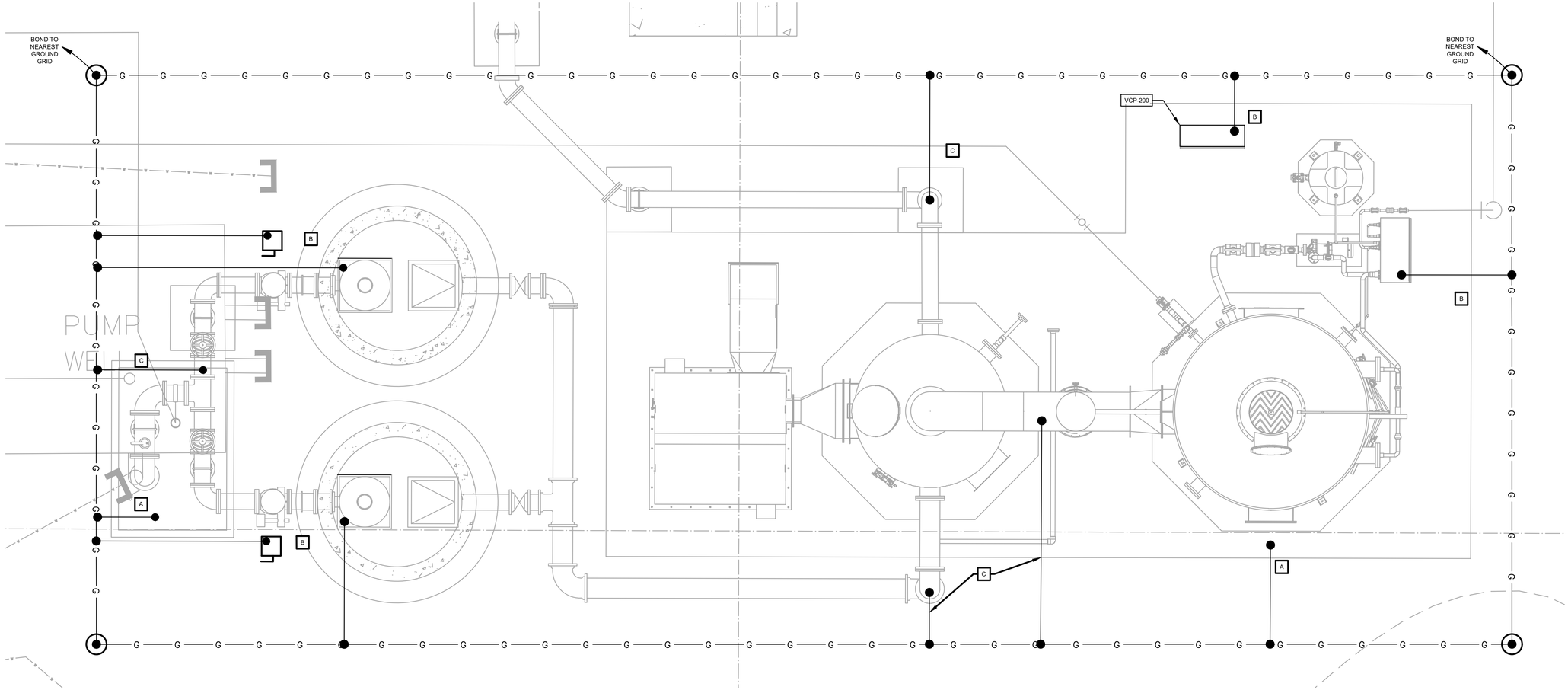
1. CONTRACTOR SHALL ENSURE ELECTRICAL GEAR CONNECTED TO GROUNDING GRID BY CHECKING AT MULTIPLE POINTS THROUGHOUT GROUNDING SYSTEM TO VERIFY PROPER RESISTANCE. GROUNDING TO BE ACCOMPLISHED BY THIRD PARTY CONTRACTOR CERTIFIED TO PERFORM GROUNDING TEST.
2. BOND VENDOR SUPPLIED EQUIPMENT TO GROUND GRID AS REQUIRED BY THE MANUFACTURER.

KEY NOTES

A. BOND REBAR TO GROUND GRID.

B. BOND ELECTRICAL EQUIPMENT TO NEAREST ADJACENT GROUND GRID IN AT LEAST TWO PLACES.

C. BOND PIPE TO GROUND GRID.



ENLARGED ELECTRICAL GROUNDING AND LIGHTNING PROTECTION SITE PLAN (BID ALTERNATIVE)

0 2 4 6

SCALE: 3/8" = 1'-0"

NO.	BY	DATE	SYMBOL	REVISIONS
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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	L.BURNSIDE
DRAWN BY:	W.HILL
DATE:	JUNE 2026
CHECKED BY:	T.PRICE
DATE:	JUNE 2026

DESIGN ENGINEER
ANTONIO GONZALEZ JR., P.E.
FLORIDA REGISTRATION NO.
86300

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

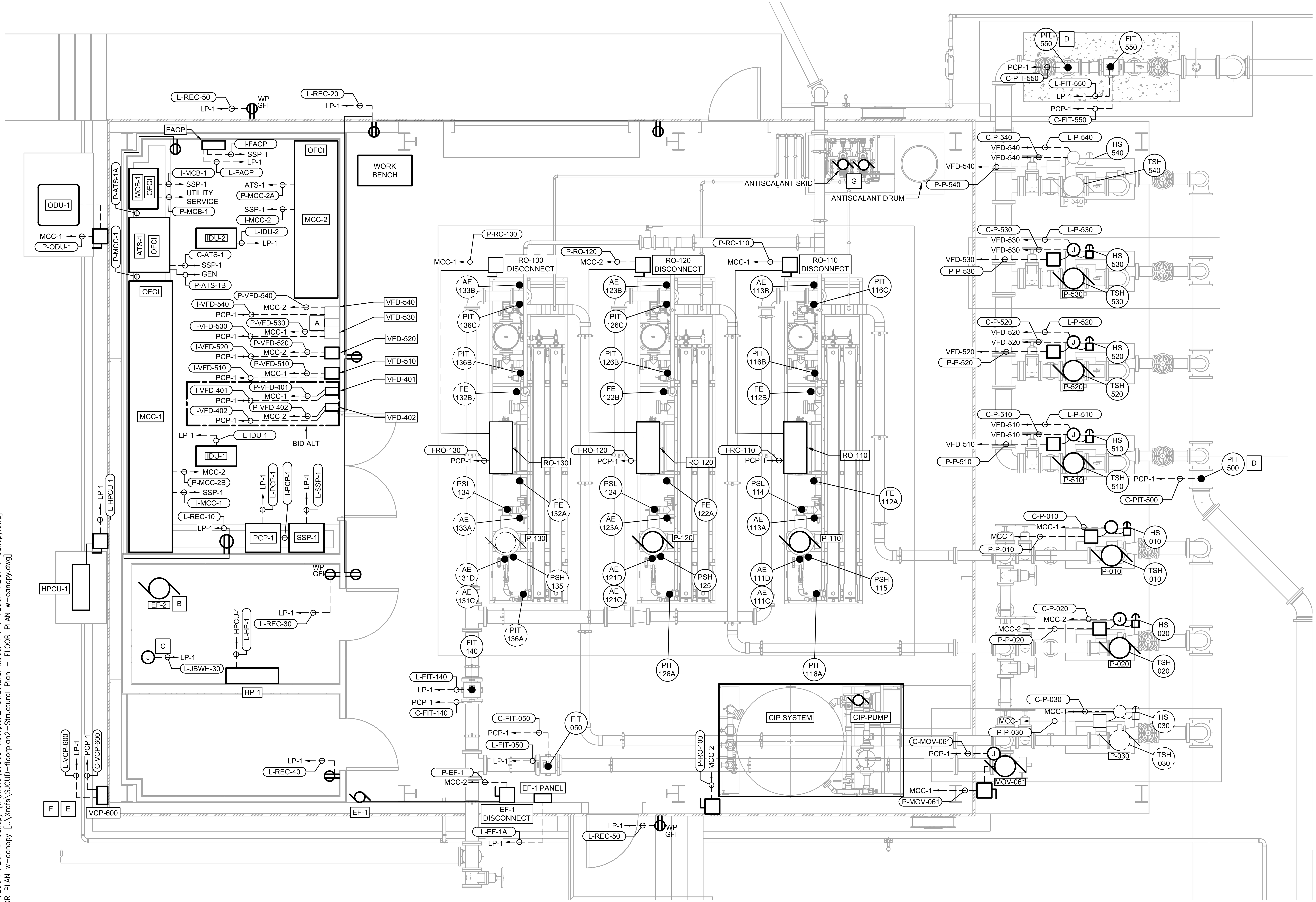
GROUNDING AND LIGHTNING PROTECTION SITE PLAN (BID ALTERNATIVE)

SHEET NO. 57
DWG NO. E-2.5
100% SUBMITTAL

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Xrefs Attached: SJCUD_22X34_BOR_FM [..\Xrefs\SJCUD_22X34_BOR.dwg]
Xref-Prop-Layout [..\..\C-Civil engineering\Xrefs\Xref-Prop-Layout.dwg]
Xref-Survey [..\..\C-Civil engineering\Xrefs\Xref-Survey.dwg]
5021011.30-015_V-Survey-Xref [..\..\C_Civil Engineering\Xrefs\5021011.30-015_V-Survey-Xref.dwg]
Xref-ALL_Bid-Layout [..\..\C_Civil Engineering\Xrefs\Xref-ALL_Bid-Layout.dwg]
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Thu Jun 04, 2026 – 13:30 Current Layout Tab = Treatment Bldg Elec Plan
E-2.6_NB_WTP.dwg
Xrefs Attached= SJCUD_22X34_BOR-E [..\Xrefs\SJCUD_22X34_BOR-E.dwg]
SJCUD_22X34_BOR [..\..\C_Civil Engineering\Xrefs\SJCUD_22X34_BOR.dwg]
X-Treatment Building [..\Xrefs\X-Treatment Building Elec.dwg]
SJCUD-floorplan2-Structural Plan – FLOOR PLAN w-canopy [..\Xrefs\SJCUD-floorplan2-Structural Plan – FLOOR PLAN w-canopy.dwg]
SJCUD-floorplan2-Structural Model-rvt-1-FLOOR PLAN w-canopy [..\Xrefs\SJCUD-floorplan2-Structural Model-rvt-1-FLOOR PLAN w-canopy.dwg]
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TREATMENT BUILDING ELECTRICAL PLAN

0 3 6
SCALE: 1" = 3'

GENERAL NOTES

1. PROVIDE 3' WIDE ELECTRICAL SAFETY MATS AROUND EACH PIECE OF INTERIOR ELECTRICAL EQUIPMENT WITH A VOLTAGE TO GROUND GREATER THAN 50 VOLTS. MATS SHALL BE: 1/4" THICK, TYPE 11 CLASS 2, RECOMMENDED MAX VOLTAGE OF 17,000 VOLTS AC RMS. MATS SHALL MEET OZONE, FLAME AND OIL RESISTANCE REQUIREMENTS.

KEY NOTES

A. EXISTING VFDS RELOCATED.

B. WIRE EF-2 LIGHTING INTO RESTROOM LIGHTING CIRCUIT.

C. POINT OF USE JUNCTION BOX WATER HEATER JBWH-30.

D. CONTRACTOR SHALL FIELD COORDINATE LOCATION.

E. CONTRACTOR TO COORDINATE FINAL FIELD LOCATION WITH OWNER IN PROXIMITY TO GRINDER WET WELL.

F. PROVIDE SEAL OFF FITTINGS AT VCP-600 FOR CONDUITS ENTERING FROM GRINDER WET WELL.

G. CONTRACTOR SHALL COORDINATE WITH EQUIPMENT MANUFACTURER AND VERIFY FINAL POWER SOURCE REQUIREMENTS.

NO.	BY	DATE	SYMBOL	REVISIONS

MOTT MACDONALD
Mott MacDonald Florida, LLC
Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	L.BURNSIDE
DRAWN BY:	W.HILL
DATE:	JUNE 2026
CHECKED BY:	T.PRICE
DATE:	JUNE 2026

DESIGN ENGINEER
ANTONIO GONZALEZ JR., P.E.
FLORIDA REGISTRATION NO.
86300

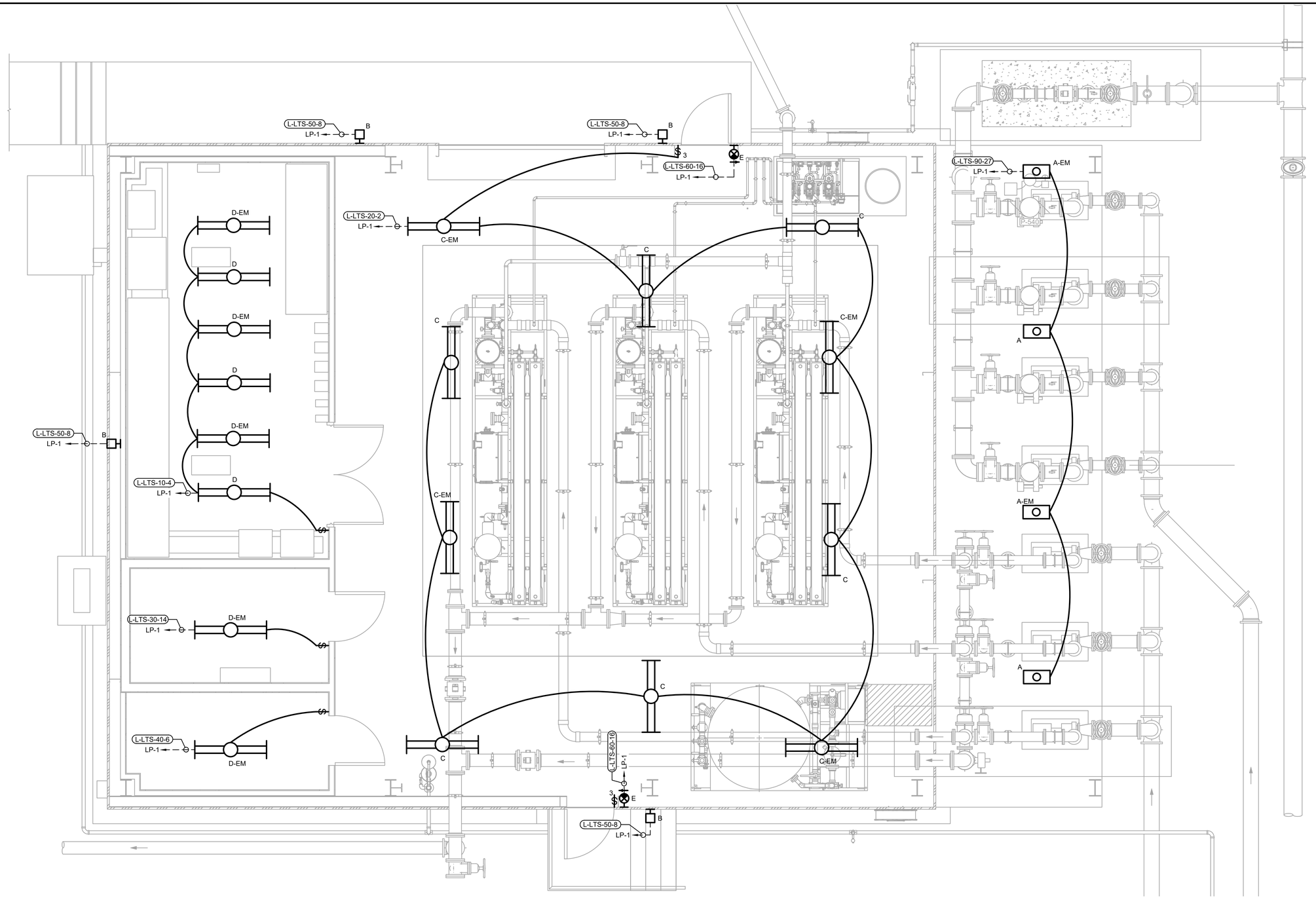
St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

TREATMENT BUILDING ELECTRICAL PLAN

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TREATMENT BUILDING LIGHTING PLAN

SCALE: 1" = 3'

GENERAL NOTES

1. REFER TO SHEET E-3.1 FOR LIGHTING FIXTURE SCHEDULE.

KEY NOTES

A. KEY NOTE.

NO.	BY	DATE	SYMBOL	REVISIONS
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Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	L.BURNSIDE
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DESIGN ENGINEER
ANTONIO GONZALEZ JR., P.E.
FLORIDA REGISTRATION NO.
86300

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

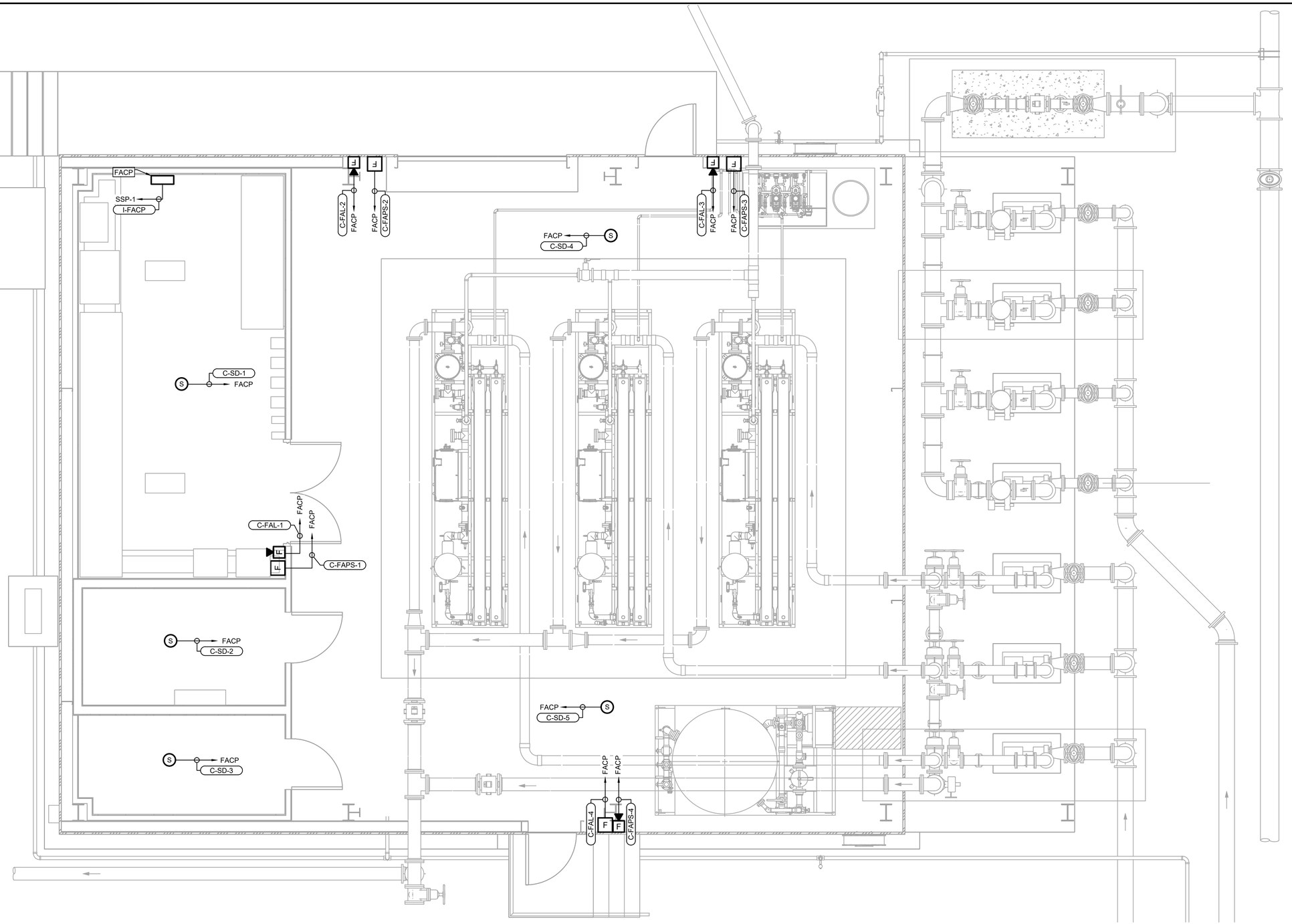
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

TREATMENT BUILDING LIGHTING PLAN

SHEET NO. 59
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TREATMENT BUILDING FIRE ALARM PLAN

0 3 6

SCALE: 1" = 3'

FIRE ALARM NOTES

1. FIRE ALARM CONTRACTOR SHALL PROVIDE AND INSTALL A FULLY OPERATIONAL FIRE PROTECTION SYSTEM.
2. ALL WORK SHALL BE IN ACCORDANCE WITH FBC, NFPA 13, NFPA 72, NEC, AND LOCAL AUTHORITY HAVING JURISDICTION.
3. FIRE ALARM CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING PERMITS AND MAKING PLAN REVISIONS AS DIRECTED AND REQUIRED.
4. OWNER WILL PROVIDE A COMMUNICATIONS LINE FOR THE FIRE ALARM CONTROL PANEL.
5. CONTRACTOR TO PROVIDE 3/4" CONDUIT FROM ALL FIRE ALARM DEVICES TO FIRE ALARM CONTROL PANEL AS REQUIRED.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL DETAILED FIRE ALARM DESIGN REQUIRED BY FLORIDA LAW.
7. THE CONTRACTOR SHALL PROVIDE SIGNED AND SEALED FIRE ALARM INSTALLATION DRAWINGS BY A FLORIDA P.E. (THE FLORIDA P.E. WILL ACT AS A DELEGATE ENGINEER FOR THE DESIGN OF THE FIRE ALARM SYSTEM).
8. THE DEVICES SHOWN ON THE PLANS REPRESENT THE MINIMUM NUMBER OF REQUIRED DEVICES.
9. THE DELEGATE ENGINEER OF RECORD FOR THE FIRE ALARM SYSTEM SHALL COMPLY WITH FLORIDA STATUE 61G15-33.006.

DATE	SYMBOL	REVISIONS

MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	L.BURNSIDE
DRAWN BY:	W.HILL
DATE:	JUNE 2026
CHECKED BY:	T.PRICE
DATE:	JUNE 2026

DESIGN ENGINEER
ANTONIO GONZALEZ JR., P.E.
FLORIDA REGISTRATION NO.
86300

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

TREATMENT BUILDING FIRE ALARM PLAN

SHEET NO. 60
DWG NO. E-2.8
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Xrefs Attached= SJCUD_22X34_BOR-E [..\Xrefs\SJCUD_22X34_BOR-E.dwg]
SJCUD_22X34_BOR [..\..\C_Civil Engineering\Xrefs\SJCUD_22X34_BOR.dwg]
SJCUD-floorplan2 [..\Xrefs\SJCUD-floorplan2.dwg]
X-Treatment Building Fire [..\Xrefs\X-Treatment Building Fire.dwg]
X-Treatment Building Fire-Structural [..\Xrefs\X-Treatment Building Fire-Structural.dwg]
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SJCUD-floorplan2-Structural Plan - FLOOR PLAN w-canopy [..\Xrefs\SJCUD-floorplan2-Structural Plan - FLOOR PLAN w-canopy.dwg]

PANEL:	PANEL-LP-1				LOCATION:		ELECTRICAL ROOM					
OPTIONS												
VOLTS L-L:	240		MAIN OVERCURRENT:	200A MCB	BUS MATERIAL:		Cu	MOUNTING:	MCC			
VOLTS L-N:	120		MAIN BUS RATING:	200A	NEUTRAL SIZE:		100%	ENCLOSURE TYPE:	NEMA 12			
PHASE:	1		MINIMUM A.I.C.:	22kA				GROUND:	EQUIPMENT			
WIRE:	3											
LOAD DATA												
CKT#	BKR.	POLE	TYPE	DESCRIPTION	VA	L1	L2	VA	DESCRIPTION	TYPE	POLE	BKR.	CKT#
1	20 A	1		SSP-1	500	1000		500	LTS PUMP ROOM		1	20 A	2
3	20 A	1		REC PUMP ROOM	720		1020	300	LTS ELEC ROOM		1	20 A	4
5	20 A	1		REC REST ROOM	180	230		50	LTS STORAGE		1	20 A	6
7	20 A	1		REC STORAGE ROOM	180		235	55	LTS EXTERIOR		1	20 A	8
9	20 A	1		FIT-140	200	3310		3110	GEN LOAD CENTER GLC-1		2	60A	10
11	20 A	1		FIT-550	200		1950	1750					12
13	20 A	1		FIT-050	200	400		200	LTS/EXH. FAN RESTROOM		1	20 A	14
15	20 A	1		REC ELEC ROOM	540		565	25	LTS EXIT SIGNS		1	20 A	16
17	20 A	1		PCP-1	1500	3000		1500	JB WATER HEATER RESTROOM		2	20 A	18
19	20 A	1		REC EXTERIOR	540		2040	1500					20
21	20 A	1		FIRE ALARM CONTROL PANEL	150	1050		900	EXISTING HYPO PUMP 1		1	20 A	22
23	20 A	1		LTS GEN CANOPY	300		1200	900	EXISTING HYPO PUMP 2		1	20 A	24
25	20 A	1		LTS DEGASSIFIER	100	250		150	IDU-1		2	20 A	26
27	20 A	1		LTS PUMP CANOPY	300		450	150					28
29	20 A	1		EF-1 PANEL	200	350		150	IDU-2		2	20 A	30
31	30 A	2		HPCU-1	1450		1600	150					32
33					1450	1450		0	SPARE		1	20 A	34
35	30 A	2		VCP-600 GRINDER PUMP CONTROL PANEL	2000		2000	0	SPARE		1	20 A	36
37					2000	2000		0	SPARE		1	20 A	38
39		1		SPACE			5	5	SPD		2	20 A	40
41		1		SPACE		5		5					42
				TOTAL CONNECTED LOAD (VA) PER PHASE:		13045	11065						
				CONNECTED LOAD (AMPS) PER PHASE		109	92						
				TOTAL CONNECTED LOAD (VA):	24110			DEMAND LOAD (VA):	28895				
				AVERAGE CONNECTED LOAD (AMPS):	100			AVERAGE DEMAND LOAD (AMPS):	120				

NOTES:	
1.	DEMAND LOAD CALCULATIONS BASED ON REMOVING REDUNDANT LOADING AND RECEPTACLES VA
2.	PROVIDE MANUFACTURER'S STANDARD SPD

PANEL:	GLC-1				LOCATION:		GENERATOR ENCLOSURE					
OPTIONS												
VOLTS L-L:	240		MAIN OVERCURRENT:	60A MCB	BUS MATERIAL:		Cu	MOUNTING:	SURFACE			
VOLTS L-N:	120		MAIN BUS RATING:	125A	NEUTRAL SIZE:		100%	ENCLOSURE TYPE:	NEMA 3R			
PHASE:	1		MINIMUM A.I.C.:	22kA				GROUND:	EQUIPMENT			
WIRE:	3											
LOAD DATA												
CKT#	BKR.	POLE	TYPE	DESCRIPTION	VA	L1	L2	VA	DESCRIPTION	TYPE	POLE	BKR.	CKT#
1	30A	2		JACKET WATER HEATER	1250	1610		360	GEN. ENCLOSURE RECEPTS		1	20A	2
3					1250		1750	500	GEN. ENCLOSURE LIGHTS		1	20A	4
5	20A	1		GEN. BATTERY CHARGER	300	1500		1200	SPACE HEATER		1	20A	6
7	20A	1		SPARE	0		0		SPARE		1	20A	8
9	20A	1		SPARE		0			SPARE		1	20A	10
11	20A	1		SPARE			0		SPARE		1	20A	12
13		1		SPACE		0			SPACE		1		14
15		1		SPACE			0		SPACE		1		16
17		1		SPACE		0			SPACE		1		18
19		1		SPACE			0		SPACE		1		20
21		1		SPACE		0			SPACE		1		22
23		1		SPACE			0		SPACE		1		24
				TOTAL CONNECTED LOAD (VA) PER PHASE:		3110	1750						
				CONNECTED LOAD (AMPS) PER PHASE		26	15						
				TOTAL CONNECTED LOAD (VA):	4860			DEMAND LOAD (VA):	5910				
				AVERAGE CONNECTED LOAD (AMPS):	20			AVERAGE DEMAND LOAD (AMPS):	25				

NOTES:	
1.	DEMAND LOAD CALCULATIONS BASED ON REMOVING REDUNDANT LOADING AND RECEPTACLES VA
2.	PROVIDE MANUFACTURER'S STANDARD SPD

LIGHTING FIXTURE SCHEDULE								
MARK	MANUFACTURER	CATALOG NUMBER	LAMPS-NUMBER/ TYPE	FIXTURE WATTS	LUMEN OUTPUT	TOTAL LLF	CCT	MOUNTING	REMARKS
A	LITHONIA LIGHTING	CNY LED ALO SWW2 UVOLT PE PIR DDB 40K 7500L	8/LED	51	7414	0.8	40K	SURFACE	
B	LITHONIA LIGHTING	TWX1 LED P1 40K	4/LED	11	1642	0.8	40K	WALL	8' MOUNTING HEIGHT
C	LITHONIA LIGHTING	FEM L48 6000LM IMAFL MD 80CRI 40K	10/LED	38	5653	0.8	40K	PENDANT	
D	LITHONIA LIGHTING	FEM L48 6000LM IMAFL MD 80CRI 40K	8/LED	38	5653	0.8	40K	SURFACE	
E	LITHONIA LIGHTING	ECB LED (AIMED DOWN)	2/LED	2.3	184	0.8		WALL	8' MOUNTING HEIGHT
F	LITHONIA LIGHTING	MR1 LED 42C 350 30K SR3 MVOLT	1/LED	49	4220	0.8	30K	POLE	8' MOUNTING HEIGHT

NOTES	
1.	THE FIXTURES LISTED ABOVE ARE THE BASIS OF DESIGN. TO SUPPLY EQUIVALENT FIXTURES PROVIDE THE FOLLOWING WITH BID DOCUMENTS: 1) COMPLETE PRODUCT SPECIFICATION SHEETS MARKED WITH CATALOG NUMBER AND FIXTURE TYPE, 2) CALCULATION REPORTS SHOWING THE DESIGN CRITERIA HAS BEEN MET, 3) A SUMMARY OF ALL ALTERATIONS DEVIATING FROM THE BASIS OF DESIGN, 4) ELECTRONIC COPIES OF THE IES FILES USED, 5) WRITTEN VERIFICATION THAT THE SUBMITTED FIXTURES MEET THE REQUIREMENTS OF THE CONTRACT DOCUMENTS. EQUIVALENT FIXTURES SHALL BE VERIFIED BY THE ENGINEER FOR ADEQUACY DURING THE BID REVIEW PHASE. THE CONTRACTOR SHALL STILL BEAR THE RESPONSIBILITY OF PROVIDING AND INSTALLING FIXTURES THAT MEET THE DESIGN CRITERIA AND THE QUALITY OF THE BASIS OF DESIGN PRODUCTS, AT NO ADDITIONAL COST.
2.	FIXTURE WATTAGE IS BASED ON THE TOTAL INPUT POWER AS LISTED BY THE MANUFACTURERS DATA FOR THE LAMP(S) AND BALLAST (DRIVERS) SELECTED.
3.	COORDINATE MOUNTING REQUIREMENTS AS SHOWN ON THE PLAN.
4.	FIXTURES ON PLANS OR LAYOUTS WITH "-EM" SUFFIX INDICATE REQUIREMENT FOR INCLUSION OF EMERGENCY BATTERY PACK WITH HIGHEST LUMEN OUTPUT, UNLESS OTHERWISE NOTED.

LIGHTING DESIGN CRITERIA								
APPLICATION	HORIZONTAL TARGETS			VERTICAL TARGETS			UNIFORMITY TARGETS	
	E (fc)	TYPE	ELEV.	E (fc)	TYPE	ELEV.	MAX:MIN	AVG:MIN
ELECTRICAL ROOM	50	AVG	0' AFF	20	N/A	4' AFF	3:1	
EXTERIOR PROCESS AREAS (WWTP)	20	AVG	0' AFF	15	N/A	5' AFF	5:1	
EXTERIOR PROCESS AREAS(OPEN AIR) (WWTP)	5	AVG	0' AFF	N/A	N/A	N/A	5:1	
INTERIOR PROCESS AREAS (WWTP)	20	AVG	0' AFF	15	N/A	5' AFF	5:1	
RESTROOM	15	AVG	2'-6" AFF	5	AVG	4'-0" AFF	N/A	2:1
STORAGE	10	AVG	FLOOR	3	AVG	4'-0" AFF	N/A	3:1
NOTES:								
1. DESIGN CRITERIA ARE BASED ON THE IES LIGHTING HANDBOOK, 10TH EDITION.								

PANEL AND LIGHTING SCHEDULES

NO SCALE

NO.	BY	DATE	SYMBOL	REVISIONS
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Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

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DESIGN ENGINEER
ANTONIO GONZALEZ JR., P.E.
FLORIDA REGISTRATION NO.
86300

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

PANEL AND LIGHTING SCHEDULES

SHEET NO. 61
DWG NO. E-3.1
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X-Schedules [..\Xrefs\X-Schedules.dwg]
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FEEDER MARK	# OF SETS	CONDUIT SIZE	CONDUCTOR IN EACH SET	FROM	TO	NOTES
C-ATS-1	1	1"	10#14, 1#14G	SSP-1	ATS-1	
C-ATS-2	1	-	PER MFR	GCP-1	ATS-1	
C-CP-400-A	1	1"	14#14, 1#14G	PCP-1	CP-400	
C-CP-400-B	1	1"	1-2PR#18 TWIS	PCP-1	CP-400	
C-DT-G	1	-	PER MFR	GCP-1	GREENLEAF SOLAR GAGE	
C-FAL-1	1	-	PER MFR	FACP	FIRE ALARM LIGHT 1	DELEGATED DESIGN
C-FAL-2	1	-	PER MFR	FACP	FIRE ALARM LIGHT 2	DELEGATED DESIGN
C-FAL-3	1	-	PER MFR	FACP	FIRE ALARM LIGHT 3	DELEGATED DESIGN
C-FAL-4	1	-	PER MFR	FACP	FIRE ALARM LIGHT 4	DELEGATED DESIGN
C-FAPS-1	1	-	PER MFR	FACP	FIRE ALARM PULL STATION 1	DELEGATED DESIGN
C-FAPS-2	1	-	PER MFR	FACP	FIRE ALARM PULL STATION 2	DELEGATED DESIGN
C-FAPS-3	1	-	PER MFR	FACP	FIRE ALARM PULL STATION 3	DELEGATED DESIGN
C-FAPS-4	1	-	PER MFR	FACP	FIRE ALARM PULL STATION 4	DELEGATED DESIGN
C-FIT-140	1	1"	1-2PR#18 TWIS	PCP-1	FIT-140	
C-FIT-550	1	1"	1-2PR#18 TWIS	PCP-1	FIT-550	
C-FIT-050	1	1"	1-2PR#18 TWIS	PCP-1	FIT-050	
C-GCP-1	1	1"	24#14, 1#14G	SSP-1	GCP-1	GEN CONTROL PANEL
C-LD-G	1	-	PER MFR	GREENLEAF SOLAR GAGE	FUEL LEAK DETECTION	
C-LIT-423	1	1"	4#14, 1#14G	PCP-1	LIT-423	
C-LIT-433	1	1"	4#14, 1#14G	PCP-1	LIT-433	
C-LSH-421	1	1"	4#14, 1#14G	PCP-1	LSH-421	
C-LSH-431	1	1"	4#14, 1#14G	PCP-1	LSH-431	
C-LSL-422	1	1"	4#14, 1#14G	PCP-1	LSL-422	
C-LSL-432	1	1"	4#14, 1#14G	PCP-1	LSL-432	
C-LT-G	1	-	PER MFR	GREENLEAF SOLAR GAGE	FUEL LEVEL TRANSDUCER	
C-MOV-061		1"	10#14, 1#14G	PCP-1	MOV-061	
C-MTR-1	1	1"	3#12, 1#12G	UTILITY SERVICE	SERVICE METER	
C-P-401	1	1"	6#14, 1#14G	VFD-401	P-401	BID ALTERNATE
C-P-402	1	1"	6#14, 1#14G	VFD-402	P-402	BID ALTERNATE
C-P-510	1	1"	6#14, 1#14G	VFD-510	P-510	
C-P-520	1	1"	6#14, 1#14G	VFD-520	P-520	
C-P-530	1	1"	6#14, 1#14G	VFD-530	P-530	
C-P-540	1	1"	6#14, 1#14G	VFD-540	P-540	
C-P-701	1	1"	6#14, 1#14G	MS-701	P-701	
C-P-702	1	1"	PULLSTRING	MS-702	P-702	FUTURE
C-P-010	1	1"	6#14, 1#14G	MCC-1	P-010	
C-P-020	1	1"	6#14, 1#14G	MCC-2	P-020	
C-P-030	1	1"	PULLSTRING	MCC-1	P-030	
C-PIT-500	1	1"	1-2PR#18 TWIS	PCP-1	PIT-500	
C-PIT-550	1	1"	1-2PR#18 TWIS	PCP-1	PIT-550	
C-SD-1	1	-	PER MFR	FACP	SMOKE DETECTOR 1	DELEGATED DESIGN
C-SD-2	1	-	PER MFR	FACP	SMOKE DETECTOR 2	DELEGATED DESIGN
C-SD-3	1	-	PER MFR	FACP	SMOKE DETECTOR 3	DELEGATED DESIGN
C-SD-4	1	-	PER MFR	FACP	SMOKE DETECTOR 4	DELEGATED DESIGN
C-SD-5	1	-	PER MFR	FACP	SMOKE DETECTOR 5	DELEGATED DESIGN
C-VCP-200-A	1	1"	1-2PR#18 TWIS	PCP-1	VCP-200	BID ALTERNATE
C-VCP-200-B	1	1"	12#14, 1#14G	PCP-1	VCP-200	BID ALTERNATE
C-VCP-600	1	1"	6#14, 1#14G	PCP-1	VCP-600	
I-FACP	1	1"	1-CAT6	SSP-1	FACP	
I-MCB-1	1	1"	1-CAT6	SSP-1	MCB-1	
I-MCC-1	1	1"	1-CAT6	SSP-1	MCC-1	
I-MCC-2	1	1"	1-CAT6	SSP-1	MCC-2	
I-PCP-1	1	1"	1-CAT6	SSP-1	PCP-1	
I-RO-110	1	1"	1-CAT6	PCP-1	RO-110	
I-RO-120	1	1"	1-CAT6	PCP-1	RO-120	
I-RO-130	1	1"	PULLSTRING	PCP-1	RO-130	FUTURE
I-VFD-401	1	1"	1-CAT6	PCP-1	VFD-401	BID ALTERNATE
I-VFD-402	1	1"	1-CAT6	PCP-1	VFD-402	BID ALTERNATE

FEEDER MARK	# OF SETS	CONDUIT SIZE	CONDUCTOR IN EACH SET	FROM	TO	NOTES
I-VFD-510	1	1"	1-CAT6	PCP-1	VFD-510	
I-VFD-520	1	1"	1-CAT6	PCP-1	VFD-520	
I-VFD-530	1	1"	1-CAT6	PCP-1	VFD-530	
I-VFD-540	1	1"	1-CAT6	PCP-1	VFD-540	
L-EF-1-A	1	1"	1#12, 1#12N, 1#12G	LP-1	EF-1 PANEL	
L-FACP	1	1"	1#12, 1#12N, 1#12G	LP-1	FACP	
L-FIT-140	1	1"	1#12, 1#12N, 1#12G	LP-1	FIT-140	
L-FIT-550	1	1"	1#12, 1#12N, 1#12G	LP-1	FIT-550	
L-FIT-050	1	1"	1#12, 1#12N, 1#12G	LP-1	FIT-050	
L-GLC-1	1	1"	2#6, 1#6G	LP-1	GLC-1	GEN LOAD CENTER
L-HP -1	1	-	PER MFR	HPCU-1	HP-1	
L-HPCU-1	1	1"	1#10, 1#10N, 1#10G	LP-1	HPCU-1	
L-IDU-1	1	1"	1#12, 1#12N, 1#12G	LP-1	IDU-1	
L-IDU-2	1	1"	1#12, 1#12N, 1#12G	LP-1	IDU-2	
L-JBWH-30	1	1"	1#12, 1#12N, 1#12G	LP-1	WATER HEATER RESTROOM	
L-LTS-10-4	1	1"	1#12, 1#12N, 1#12G	LP-1	LTS ELEC ROOM	
L-LTS-20-2	1	1"	1#12, 1#12N, 1#12G	LP-1	LTS PUMP ROOM	
L-LTS-30-14	1	1"	1#12, 1#12N, 1#12G	LP-1	LTS REST ROOM	
L-LTS-40-6	1	1"	1#12, 1#12N, 1#12G	LP-1	LTS STORAGE	
L-LTS-50-8	1	1"	1#12, 1#12N, 1#12G	LP-1	LTS EXTERIOR	
L-LTS-60-16	1	1"	1#12, 1#12N, 1#12G	LP-1	LTS EXIT SIGNS	
L-LTS-70-23	1	1"	1#12, 1#12N, 1#12G	LP-1	LTS GEN CANOPY	
L-LTS-80-25	1	1"	1#12, 1#12N, 1#12G	LP-1	LTS DEGASSIFIER	BID ALTERNATE
L-LTS-90-27	1	1"	1#12, 1#12N, 1#12G	LP-1	LTS PUMP CANOPY	
L-P-510	1	1"	1#12, 1#12N, 1#12G	VFD-510	P-510	HEATER
L-P-520	1	1"	1#12, 1#12N, 1#12G	VFD-520	P-520	HEATER
L-P-530	1	1"	1#12, 1#12N, 1#12G	VFD-530	P-530	HEATER
L-P-540	1	1"	1#12, 1#12N, 1#12G	VFD-540	P-540	HEATER
L-PCP-1	1	1"	1#12, 1#12N, 1#12G	LP-1	PCP-1	
L-REC-10	1	1"	1#12, 1#12N, 1#12G	LP-1	REC ELEC ROOM	
L-REC-20	1	1"	1#12, 1#12N, 1#12G	LP-1	REC PUMP ROOM	
L-REC-30	1	1"	1#12, 1#12N, 1#12G	LP-1	REC REST ROOM	
L-REC-40	1	1"	1#12, 1#12N, 1#12G	LP-1	REC STORAGE ROOM	
L-REC-50	1	1"	1#12, 1#12N, 1#12G	LP-1	REC EXTERIOR	
L-SSP-1	1	1"	1#12, 1#12N, 1#12G	LP-1	SSP-1	
L-VCP-600	1	1"	1#12, 1#12N, 1#12G	LP-1	VCP-600	
P-ATS-1A	4	3"	3#250, 1#250G	MCB-1	ATS-1	
P-ATS-1B	2	3"	3#250, 1#250G	GENERATOR	ATS-1	
P-CP-400	1	1"	3#10, 1#10G	MCC-1	CP-400	
P-EF-1	1	1"	3#10, 1#10G	MCC-2	EF-1	THROUGH DISCONNECT
P-MCB-1	4	3"	3#250, 1#250N	UTILITY SERVICE	MCB-1	
P-MCC-1	4	3"	3#250, 1#250G	ATS-1	MCC-1	
P-MCC-2A	4	3"	3#250, 1#250G	ATS-1	MCC-2	
P-MCC-2B	4	3"	3#250, 1#250G	MCC-1	MCC-2	
P-MOV-061	1	1"	3#12, 1#12G	MCC-1	MOV-061	THROUGH DISCONNECT
P-ODU-1	1	1"	3#8, 1#8G	MCC-1	ODU-1	THROUGH DISCONNECT
P-P-401	1	1"	3#10, 3#14G VFD	VFD-401	P-401	BID ALTERNATE THR DISC
P-P-402	1	1"	3#10, 3#14G VFD	VFD-402	P-402	BID ALTERNATE THR DISC
P-P-510	1	1-1/2"	3#6, 3#12G VFD	VFD-510	P-510	
P-P-520	1	1-1/2"	3#6, 3#12G VFD	VFD-520	P-520	
P-P-530	1	1-1/2"	3#6, 3#12G VFD	VFD-530	P-530	
P-P-540	1	1-1/2"	3#6, 3#12G VFD	VFD-540	P-540	
P-P-701	1	1"	3#12, 1#12G	MCC-2	P-701	THROUGH DISCONNECT
P-P-702	1	1"	PULLSTRING	MCC-1	P-702	FUTURE, THR DISC
P-P-010	1	1"	3#10, 1#10G	MCC-1	P-010	
P-P-020	1	1"	3#10, 1#10G	MCC-2	P-020	
P-P-030	1	1"	3#10, 1#10G	MCC-1	P-030	
P-RO-100	1	1"	3#6, 1#6G	MCC-2	RO-100	THROUGH DISCONNECT

CONDUIT AND CONDUCTOR SCHEDULE

NO SCALE

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NO.	BY	DATE	SYMBOL	REVISIONS
6.				
5.				
4.				
3.				
2.				
1.				

MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	L.BURNSIDE
DRAWN BY:	W.HILL
DATE:	JUNE 2026
CHECKED BY:	T.PRICE
DATE:	JUNE 2026

DESIGN ENGINEER
ANTONIO GONZALEZ JR., P.E.
FLORIDA REGISTRATION NO.
86300

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

CONDUIT AND CONDUCTOR SCHEDULE

SHEET NO. 62
DWG NO. E-3.2
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FEEDER MARK	# OF SETS	CONDUIT SIZE	CONDUCTOR IN EACH SET	FROM	TO	NOTES
P-RO-110	1	2"	3#1/0, 1#1/0G	MCC-1	RO-110	THROUGH DISCONNECT
P-RO-120	1	2"	3#1/0, 1#1/0G	MCC-2	RO-120	THROUGH DISCONNECT
P-RO-130	1	2"	PULLSTRING	MCC-1	RO-130	FUTURE, THR DISC
P-VCP-200	1	1"	3#10, 1#10G	MCC-1	VCP-200	BID ALTERNATE
P-VFD-401	1	1"	3#10, 1#10G	MCC-1	VFD-401	BID ALTERNATE
P-VFD-402	1	1"	3#10, 1#10G	MCC-2	VFD-402	BID ALTERNATE
P-VFD-510	1	1"	3#6, 1#6G	MCC-1	VFD-510	
P-VFD-520	1	1"	3#6, 1#6G	MCC-2	VFD-520	
P-VFD-530	1	1"	3#6, 1#6G	MCC-1	VFD-530	
P-VFD-540	1	1"	3#6, 1#6G	MCC-2	VFD-540	

CONDUIT AND CONDUCTOR SCHEDULE

NO SCALE

NO.	BY	DATE	SYMBOL	REVISIONS
6.				
5.				
4.				
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1.				

MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	L.BURNSIDE
DRAWN BY:	W.HILL
DATE:	JUNE 2026
CHECKED BY:	T.PRICE
DATE:	JUNE 2026

DESIGN ENGINEER
ANTONIO GONZALEZ JR., P.E.
FLORIDA REGISTRATION NO.
86300

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

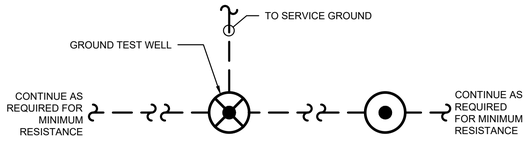
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

CONDUIT AND CONDUCTOR SCHEDULE

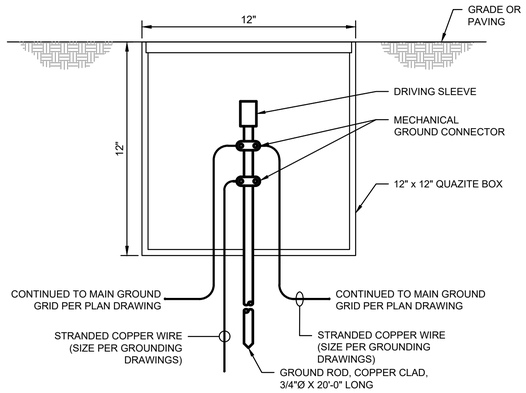
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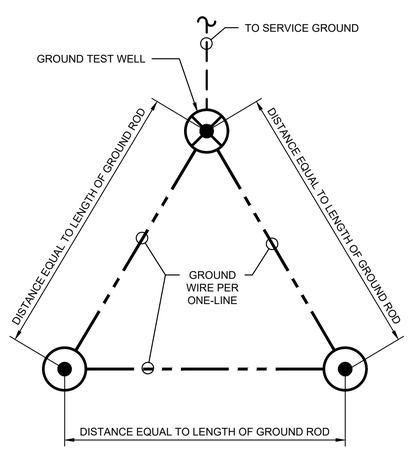
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X-Schedules [..\Xrefs\X-Schedules.dwg]
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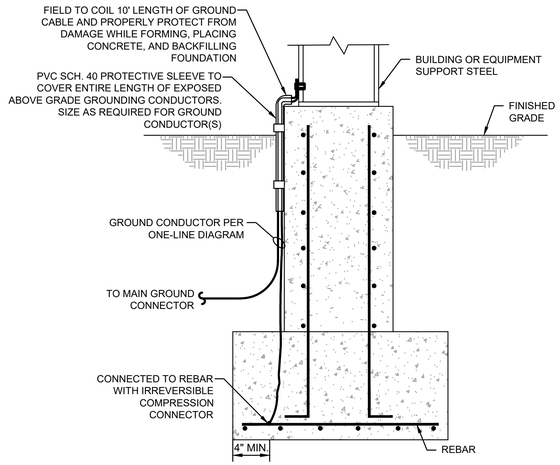
A GROUND LOOP INSTALLATION
NTS



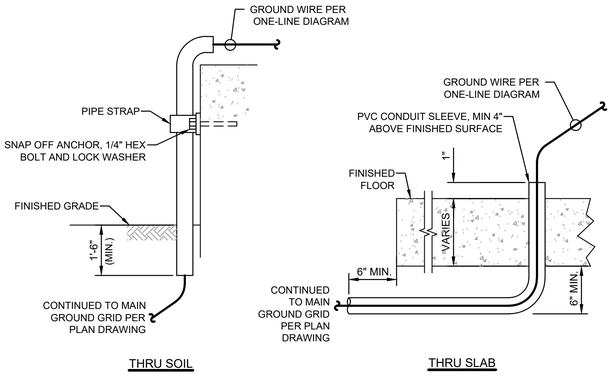
E GROUND TEST WELL
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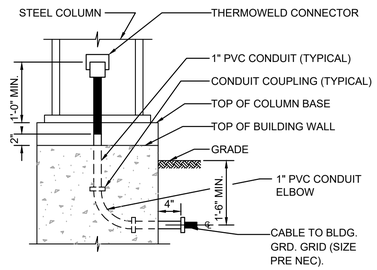
I GROUND INSTALLATION GROUND TRIAD



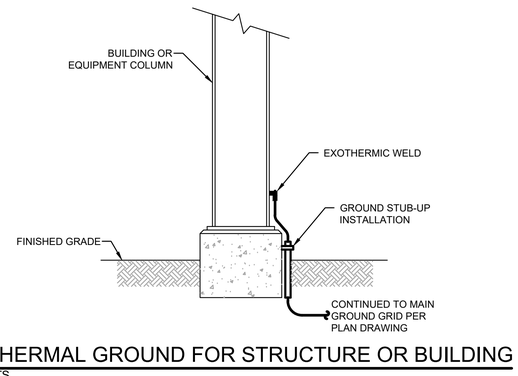
B FOUNDATION GROUNDING
NTS



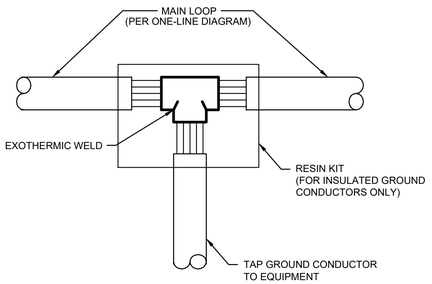
F GROUND STUB UP INSTALLATION
NTS



J GROUND CONNECTION AT BUILDING COLUMNS

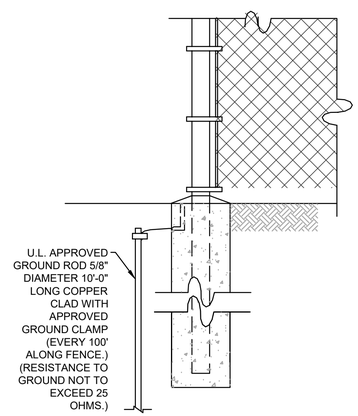


C THERMAL GROUND FOR STRUCTURE OR BUILDING
NTS

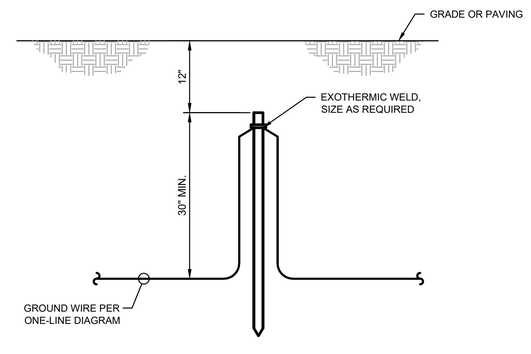


NOTE:
WHEN INSULATION IS REQUIRED PER THE ONE-LINE DIAGRAM, IT IS TO BE STRIPPED BACK ENOUGH FOR EXOTHERMIC WELD BUT NOT PAST RESIN MOLD.

G GROUND LOOP & EQUIPMENT TAP - CADWELD
NTS

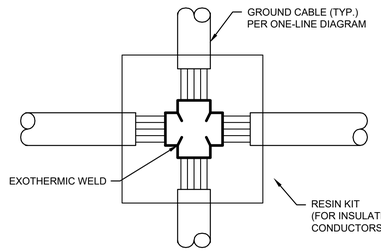


K CHAIN LINK FENCE GROUNDING DETAIL



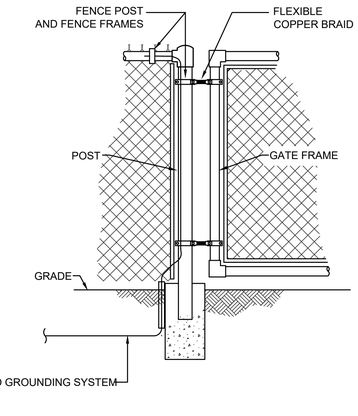
NOTE:
REFER TO SPECIFICATIONS FOR MINIMUM SYSTEM RESISTANCE TO GROUND. IF THIS RESISTANCE CANNOT BE MET WITH SINGLE 20' RODS, ADD ADDITIONAL SECTIONS TO RODS OR ADD NEW RODS AS REQUIRED SPACED WITH A DISTANCE EQUAL TO LENGTH OF GROUND ROD.

D GROUND ROD ASSEMBLY
NTS

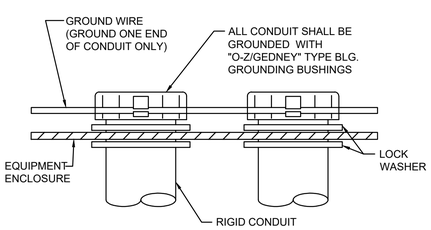


NOTE:
WHEN INSULATION IS REQUIRED PER THE ONE-LINE DIAGRAM, IT IS TO BE STRIPPED BACK ENOUGH FOR EXOTHERMIC WELD BUT NOT PAST RESIN MOLD.

H MAIN GROUNDING LOOP 4 WAY TAP
NTS



L FENCE GATE GROUNDING DETAIL



M CONDUIT GROUNDING AT ENCLOSURES

NO.	BY	DATE	SYMBOL	REVISIONS
6.				
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4.				
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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	L.BURNSIDE
DRAWN BY:	W.HILL
DATE:	JUNE 2026
CHECKED BY:	T.PRICE
DATE:	JUNE 2026

DESIGN ENGINEER
ANTONIO GONZALEZ JR., P.E.
FLORIDA REGISTRATION NO.
86300

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

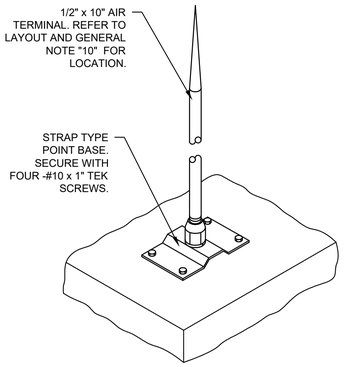
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

GROUNDING DETAILS

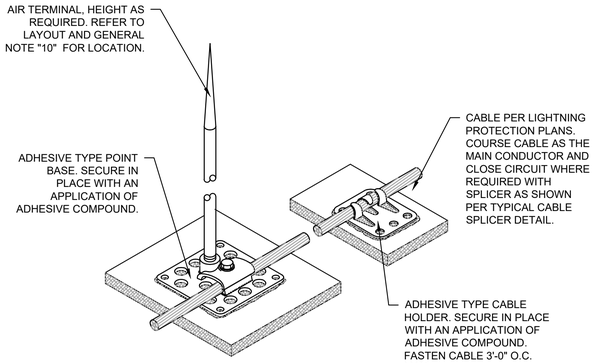
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DWG NO. ED-0.1
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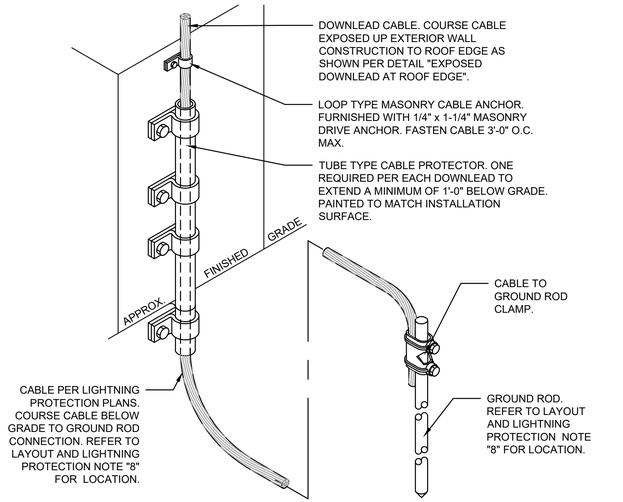
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X-Details [..\Xrefs\X-Details.dwg]
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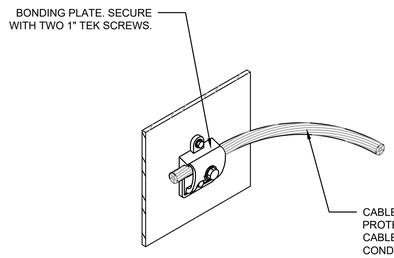
A EQUIPMENT AIR TERMINAL
NTS



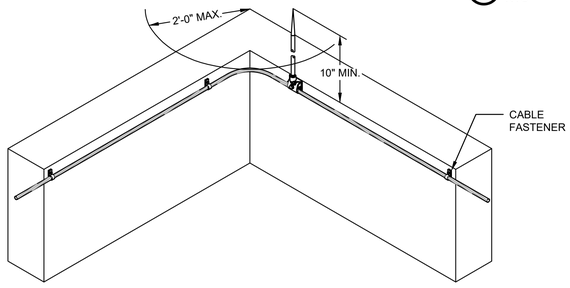
B ADHESIVE AIR TERMINAL (PREFERRED)
NTS



C EXPOSED DOWNLEAD TO GROUNDING CONNECTION
NTS



D TYPICAL EQUIPMENT HOUSING BOND
NTS

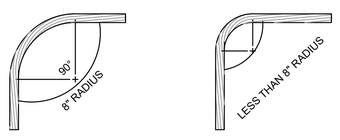


NOTE:
THIS DETAIL DEPICTS NO SPECIFIC AREA SHOWN ON THE LAYOUT. THIS DETAIL ILLUSTRATES TYPICAL AIR TERMINAL PLACEMENT FOR EITHER PARAPETS OR FLAT ROOFS.

E TYPICAL AIR TERMINAL PLACEMENT AT OUTSIDE CORNERS
NTS

LIGHTNING PROTECTION NOTES

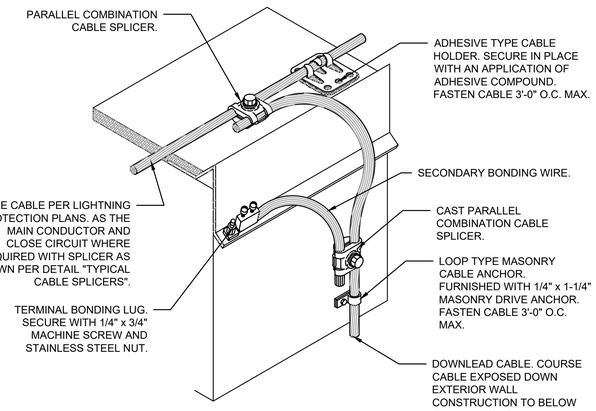
1. THE DESIGN LAYOUT AND INSTALLATION DETAILS SHOWN HERON SHALL MEET THE REQUIREMENTS OF UNDERWRITERS' LABORATORIES STANDARD 96A FOR MASTER LABELED LIGHTNING PROTECTION SYSTEMS. THE ACTUAL MASTER LABEL WILL BE DELIVERED UPON COMPLETION OF INSTALLATION.
2. THE LIGHTNING PROTECTION INSTALLATION SHALL COMPLY IN ALL RESPECTS TO LIGHTNING PROTECTION INSTITUTE STANDARD 175. THE INSTALLATION SHALL BE MADE BY OR UNDER THE SUPERVISION OF AN L.P.I. CERTIFIED MASTER INSTALLER. THE COMPLETED INSTALLATION WILL RECEIVE SYSTEM CERTIFICATION SUBMITTAL FOR LPI 176.
3. LIGHTNING PROTECTION SYSTEM SHALL BE DESIGNED BY A MEMBER OF THE LIGHTNING PROTECTION INSTITUTE. SYSTEM DESIGN SHALL BE SUBMITTED FOR REVIEW & APPROVAL. DESIGN SHALL MEET THE REQUIREMENTS OF NFPA 780, CURRENT EDITION.
4. METAL BODIES OF INDUCTANCE LOCATED ABOUT THE ROOF SUCH AS; METAL FLASHING GRAVEL STOPS, ROOF DRAINS, SOIL PIPE VENTS, INSULATION VENTS, LOUVERS AND DOOR FRAMES SITUATED WITHIN 6'-0" OF A LIGHTING CONDUCTOR OR BONDED METAL BODY SHALL BE INTERCONNECTED TO THE LIGHTING CONDUCTOR SYSTEM.
5. NO BEND OF A CONDUCTOR SHALL FORM A FINAL INCLUDED ANGLE OF LESS THAN 90° NOR SHALL HAVE A RADIUS OF BEND LESS THAN 8".
6. CONDUCTORS SHALL INTERCONNECT ALL AIR TERMINALS AND SHALL PROVIDE FOR A TWO WAY PATH FROM EACH AIR TERMINAL HORIZONTALLY OR DOWNWARD TO CONNECTIONS WITH GROUND TERMINALS.
7. ALL LIGHTNING PROTECTION CONDUCTORS SHALL BE FASTENED NOT MORE THAN 3'-0" MAXIMUM SPACING.
8. CONNECTIONS TO GROUND ROD OR GROUND LOOP CONDUCTOR SHALL BE MADE AT A POINT NOT LESS THAN 1'-0" BELOW GRADE AND 2'-0" AWAY FROM FOUNDATION WALL.
9. ACTUAL JOB-SITE CONDITIONS MAY NECESSITATE SLIGHT ALTERATIONS IN AIR TERMINAL AND GROUND ROD LOCATIONS.
10. AIR TERMINALS SHALL BE PLACED AT ALL UNPROTECTED OUTSIDE CORNERS AND LOCATED INTERMEDIATELY ON 20'-0" MAXIMUM SPACING AROUND THE ROOF PERIMETER OR RIDGE AND WITHIN 2'-0" OF OUTSIDE EDGE.
11. MIDROOF AIR TERMINALS SHALL BE PLACED ON 50'-0" MAXIMUM SPACING.
12. BOND ALL METALLIC PIPES INCLUDING WATER, FIRE, GAS, SEWER, STORM, ETC. WHICH ENTER THE STRUCTURE TO THE NEAREST DOWNLEAD, GROUND ROD OR GROUND LOOP.
13. BARE COPPER LIGHTNING PROTECTION MATERIALS SHALL NOT BE INSTALLED ON ALUMINUM ROOF OR SIDING OR OTHER ALUMINUM SURFACES AND VICE VERSA. ALUMINUM LIGHTNING PROTECTION MATERIALS SHALL NOT BE INSTALLED ON COPPER ROOFING OR COPPER SIDING OR OTHER COPPER SURFACES.
14. FOR SAKE OF CLARITY, WE HAVE NOT LABELED EACH INDIVIDUAL ITEM OF LIGHTNING PROTECTION MATERIALS ON THE ROOF PLAN. WE HAVE SHOWN INSTALLATION DETAILS AND HAVE CALLED OUT EACH OF THESE DETAILS ON THE ROOF PLAN ONLY AT RANDOM LOCATIONS.
15. THE LIGHTNING PROTECTION SYSTEM SHALL BE INSTALLED IN A NEAT AND INCONSPICUOUS MANNER SO THAT ALL COMPONENTS WILL BLEND IN WITH THE APPEARANCE OF THE BUILDING.
16. SEAL ENDS OF CONDUIT MOISTURE TIGHT WITH DUCT SEAL OR LEAD WEDGE.
17. ALL CONDUIT, CONDUIT FASTENERS AND MISCELLANEOUS STEEL SHALL BE MADE ELECTRICALLY CONTINUOUS THROUGHOUT CONSTRUCTION BY WELDING, CLIPPING, BOLTING OR OTHER APPROVED METHODS.
18. ALL REINFORCING, STRUCTURAL, FRAMING AND MISCELLANEOUS STEEL SHALL BE MADE ELECTRICALLY CONTINUOUS THROUGHOUT CONSTRUCTION BY WELDING, CLIPPING, BOLTING OR OTHER APPROVED METHODS.
19. TELEPHONE AND/OR ELECTRICAL SERVICE ENTRANCE GROUNDS SHALL BE INTERCONNECTED TO ONE LIGHTNING PROTECTION GROUND OR WATER PIPE.
20. ALL AREAS ILLUSTRATED IN THESE SUBMITTAL DOCUMENTS WHICH HAVE NOT BEEN PROVIDED WITH LIGHTNING PROTECTION COMPONENTS ARE PROTECTED FROM HIGHER ROOFS OR STRUCTURES. THESE AREAS FALL WITHIN A "ZONE OF PROTECTION" AS ESTABLISHED BY THE CURRENT EDITION OF THE CODE FOR PROTECTION AGAINST LIGHTNING "ANSI/NFPA" AND THE INSTALLATION REQUIREMENTS FOR LIGHTNING PROTECTION SYSTEMS AS PROVIDED BY STANDARD 96A OF UNDERWRITERS' LABORATORIES.
21. ALL ADHESIVE TYPE FITTINGS SHALL BE SET IN PLACE WITH AN APPLICATION OF COMPATIBLE ROOF CEMENT OR A/C NO. P899LN ADHESIVE COMPOUND BEFORE ROOF GRAVEL IS APPLIED.
22. ARRESTERS ARE REQUIRED ON ELECTRICAL SERVICE PANEL, DATA AND TELEPHONE LINE ENTRANCES BY THE ELECTRICAL CONTRACTOR OR BY VARIOUS UTILITY AGENCIES.



ACCEPTABLE
REFER TO GENERAL NOTE 5

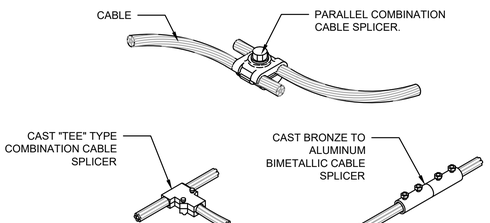
NOT ACCEPTABLE

NOT ACCEPTABLE



F EXPOSED DOWNLEAD AT ROOF EDGE
NTS

G TYPICAL CABLE BEND REQUIREMENTS
NTS



H TYPICAL CABLE SPLICERS
NTS

NO.	BY	DATE	SYMBOL	REVISIONS
6.				
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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	L.BURNSIDE
DRAWN BY:	W.HILL
DATE:	JUNE 2026
CHECKED BY:	T.PRICE
DATE:	JUNE 2026

DESIGN ENGINEER
ANTONIO GONZALEZ JR., P.E.
FLORIDA REGISTRATION NO.
86300

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

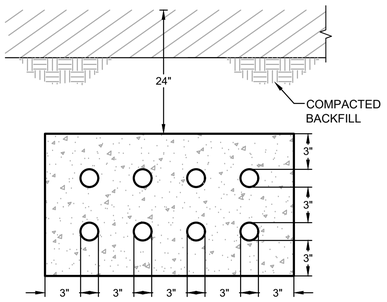
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

LIGHTNING PROTECTION DETAILS

SHEET NO. 65
DWG NO. ED-0.2
100% SUBMITTAL

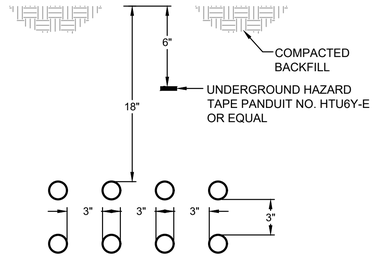
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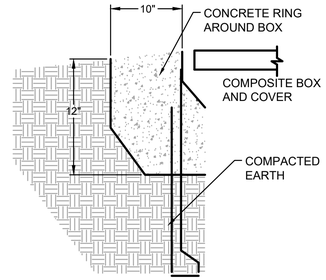
1. CONCRETE SHALL BE 3000 PSI FIBER REINFORCED (RED IN COLOR).
2. CONDUITS INSTALLED UNDERGROUND SHALL BE PROVIDED WITH CARLON "SNAP-N-STAC" COMBO SPACERS DESIGNED TO PROVIDE 3" CONDUIT SEPARATION. SPACERS SHALL BE INSTALLED PER MFG. RECOMMENDATIONS.
3. CONDUIT SEPARATION MAY BE REDUCED TO 1-1/2" WITHIN 10' OF HANDHOLE/MANHOLE PROVIDED "FLOWABLE FILL" IS USED AROUND CONDUIT FOR COMPACTION.
4. POWER AND CONTROL DUCT BANKS SHALL BE SEPARATED BY A MIN. OF 12".

A UNDER ROADWAY/DRIVEWAY PROTECTED CONDUIT INSTALLATION
NO SCALE



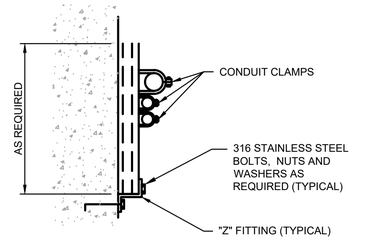
NOTES:
1. CONDUITS INSTALLED UNDERGROUND SHALL BE PROVIDED WITH CARLON "SNAP-N-STAC" COMBO SPACERS DESIGNED TO PROVIDE 3" CONDUIT SEPARATION. SPACERS SHALL BE INSTALLED PER MFG. RECOMMENDATIONS.
2. CONDUIT SEPARATION MAY BE REDUCED TO 1-1/2" WITHIN 10' OF HANDHOLE/MANHOLE PROVIDED "FLOWABLE FILL" IS USED AROUND CONDUIT FOR COMPACTION.
3. POWER AND CONTROL DUCT BANKS SHALL BE SEPARATED BY A MIN. OF 12".

B UNDERGROUND NON-PROTECTED CONDUIT INSTALLATION
NO SCALE



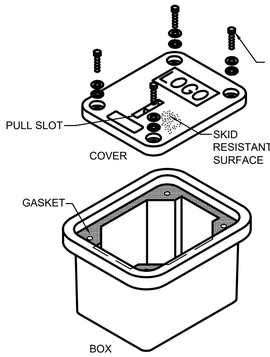
HANDHOLE NOTES:
1. CONCRETE ENCASEMENT TO BE 3,000 PSI FIBER REINFORCED.
2. HANDHOLES TO BE INSTALLED OVER 12" OF 3/4" BROKEN STONE OR GRAVEL ON COMPACTED SUBGRADE.
3. HANDHOLE SHALL BE 24"W X 24"L X 24"D MINIMUM, LARGER AS REQUIRED BY NEC. UL LISTED FOR TIER 15 HEAVY DUTY LOAD; HEAVY DUTY COVER WITH "ELECTRIC", "CONTROL" OR "TELCOM" LOGO.
4. CONDUIT SHALL BE RUN THROUGH HORIZONTALLY (STACK BOXES AS REQUIRED).

C HANDHOLE DETAIL
NO SCALE

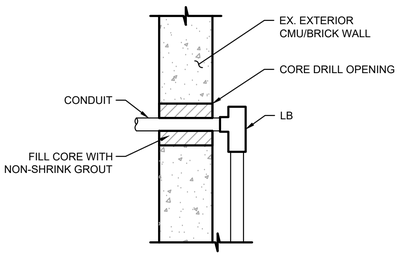


NOTES:
1. THIS DETAIL TYPICAL FOR BOTH VERTICAL AND HORIZONTAL MOUNTING.
2. CHANNEL AND ALL SUPPORT DEVICES TO BE STAINLESS STEEL.
3. CHANNEL TO BE SPACED 5' MAXIMUM.

D WALL SUPPORT FOR CONDUIT
NO SCALE

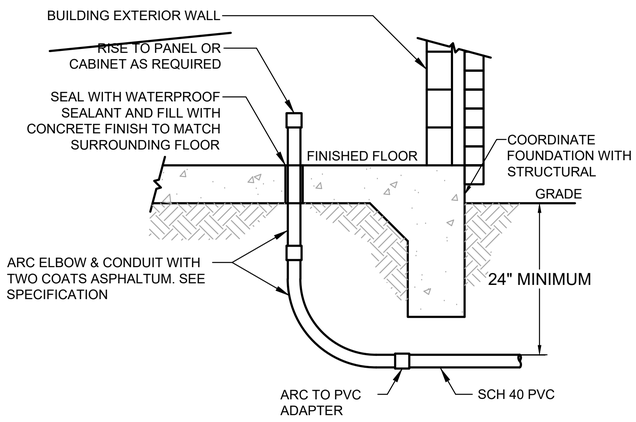


G SMALL PULL BOX
NO SCALE

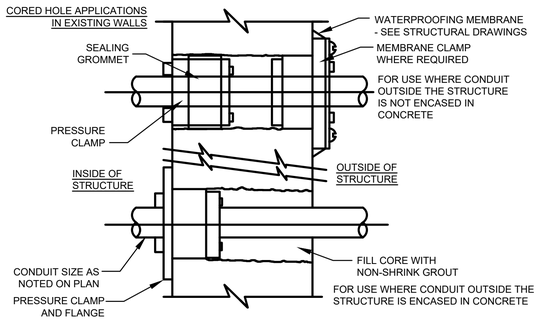


NOTE:
1. REPAIR PAINT ON INTERIOR AND EXTERIOR WALLS TO MATCH EXISTING.

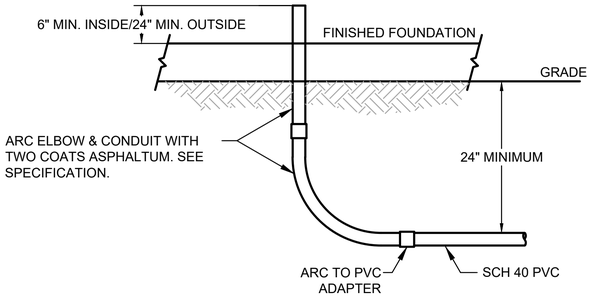
H ABOVE GRADE CONDUIT ENTRY @ EXISTING BUILDING
NO SCALE



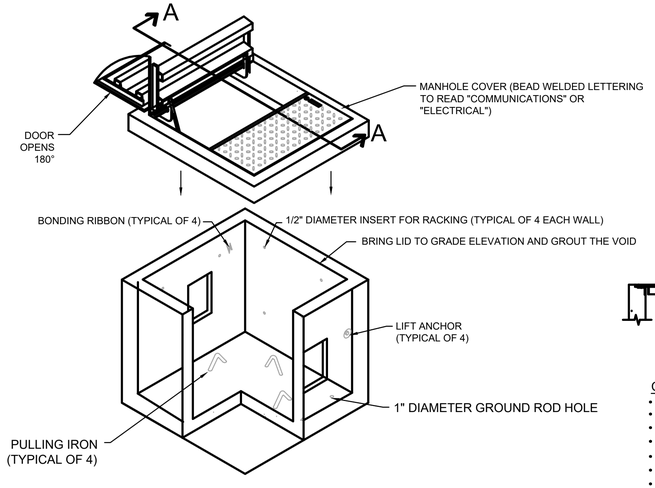
E TYPICAL CONDUIT INSTALLATION AT BUILDING DETAIL
NTS



F BELOW GRADE CONDUIT ENTRY AT EXISTING BUILDING
NO SCALE



I TYPICAL U/G PVC CONDUIT INSTALLATION DETAIL
NTS



NOTES:
1. TOP ELEVATION OF MANHOLE COVER SHALL BE NO GREATER THAN 6" ABOVE FINISHED GRADE (SEE CIVIL GRADING PLAN)
2. CONTRACTOR TO SIZE MANHOLES PER NEC (MIN. SIZE 6' X 6' X 6').
3. MANHOLE SHALL BE PRECAST CONCRETE. PRECAST MFG RESPONSIBLE FOR ALL STRUCTURAL DESIGN REQUIREMENTS.
4. MANHOLE TO BE SET ON 12" OF 3/4" BROKEN STONE OR GRAVEL (COMPACT PER PRECAST MFG. REQUIREMENTS).



MANHOLE COVER SECTION A-A

COVERS SHALL HAVE FOLLOWING:
- PENTA HEAD BOLTS
- DIAMOND PLATE SLIP RESISTANT COVER
- 1" DIAMETER PICK HOLES FOR LIFTING
- BEAD WELDED LETTERING AS REQUIRED
- DIAMETER RECESSED DROP HANDLE
- HINGED DOORS
- HOT DIPPED GALVANIZING

J MANHOLE DETAIL
NTS

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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	L.BURNSIDE
DRAWN BY:	W.HILL
DATE:	JUNE 2026
CHECKED BY:	T.PRICE
DATE:	JUNE 2026

DESIGN ENGINEER
ANTONIO GONZALEZ JR., P.E.
FLORIDA REGISTRATION NO.
86300

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

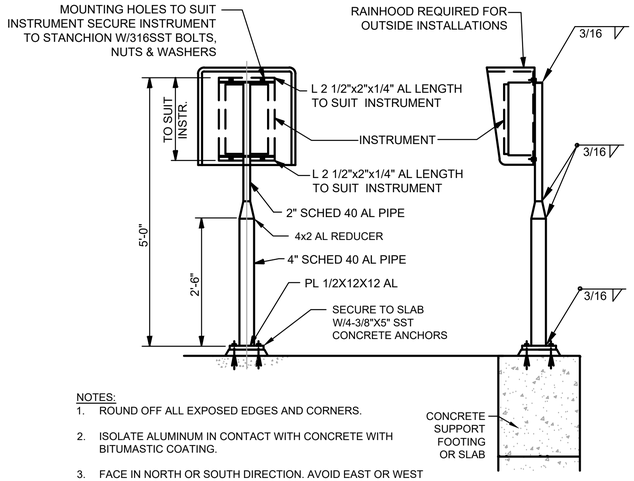
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

CONDUIT DETAILS

SHEET NO. 66
DWG NO. ED-0.3
100% SUBMITTAL

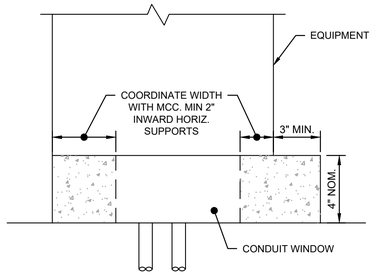
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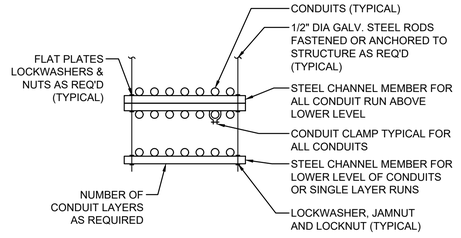


NOTES:
1. ROUND OFF ALL EXPOSED EDGES AND CORNERS.
2. ISOLATE ALUMINUM IN CONTACT WITH CONCRETE WITH BITUMASTIC COATING.
3. FACE IN NORTH OR SOUTH DIRECTION. AVOID EAST OR WEST FACING WHERE POSSIBLE.

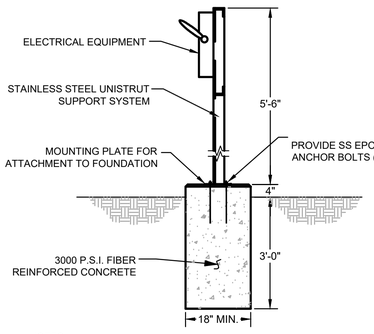
A STANCHION SUPPORT FOR CASE MOUNTED INSTRUMENTS
NO SCALE



B FLOOR MOUNTED CONCRETE BASE
NO SCALE

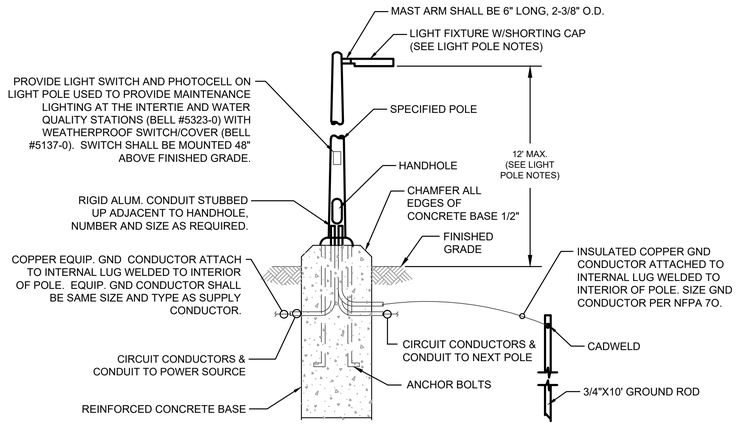


C CONDUIT SUPPORT
NO SCALE



NOTES:
1. EQUIPMENT MOUNTING RACKS SHALL BE DESIGNED BY UNISTRUT TO WITHSTAND WIND LOAD PER STRUCTURAL PLANS WITH THE PROPOSED EQUIPMENT.

D ELECTRICAL EQUIPMENT MOUNTING DETAIL
NO SCALE



E WORK LIGHT DETAIL
NO SCALE

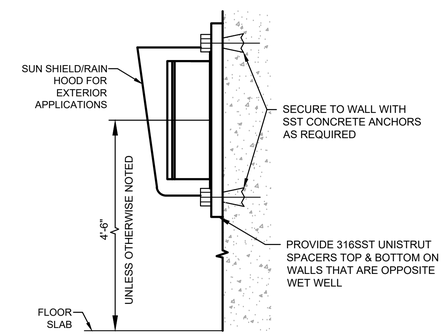
LIGHT POLE NOTES:

A. FIXTURE SHALL BE LED PER SCHEDULE 120V, WITH PHOTOCONTROL & SWITCH, POLE MOUNTED @ 42" (OR ENGINEER APPROVED EQUAL)

B. LIGHT FIXTURES SHALL BE MOUNTED AT 12'-0" (MAXIMUM) ABOVE FINISHED GRADE.

C. THE DESIGN FOR LIGHT POLES AND BASES SHOWN ON THIS SHEET ARE A BASIS OF DESIGN TO BE CONSIDERED BY A DELEGATE ENGINEER OF RECORD IN ACCORDANCE WITH F.A.C. 61G15-30.006 AND 61G15-31. THE CONTRACTOR SHALL PROVIDE THE DESIGN TO BE PERFORMED BY A DELEGATE ENGINEER OF RECORD. SUBMIT THE DELEGATED ENGINEERING DOCUMENTS WITH SHOP DRAWINGS FOR APPROVAL.

D. REFER TO STRUCTURAL DRAWINGS FOR WIND LOAD CALCULATIONS.



NOTES:
1. INSTALLATION FOR CONCRETE WALL SHOWN. FOR CMU WALL USE SST TOGGLE BOLTS IN UNGROUTED CELLS AND SST WEDGE

F WALL SUPPORT FOR CASE MOUNTED
NO SCALE

NO.	BY	DATE	SYMBOL	REVISIONS
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PHONE: (904) 209-2626 FAX: (904) 209-2627

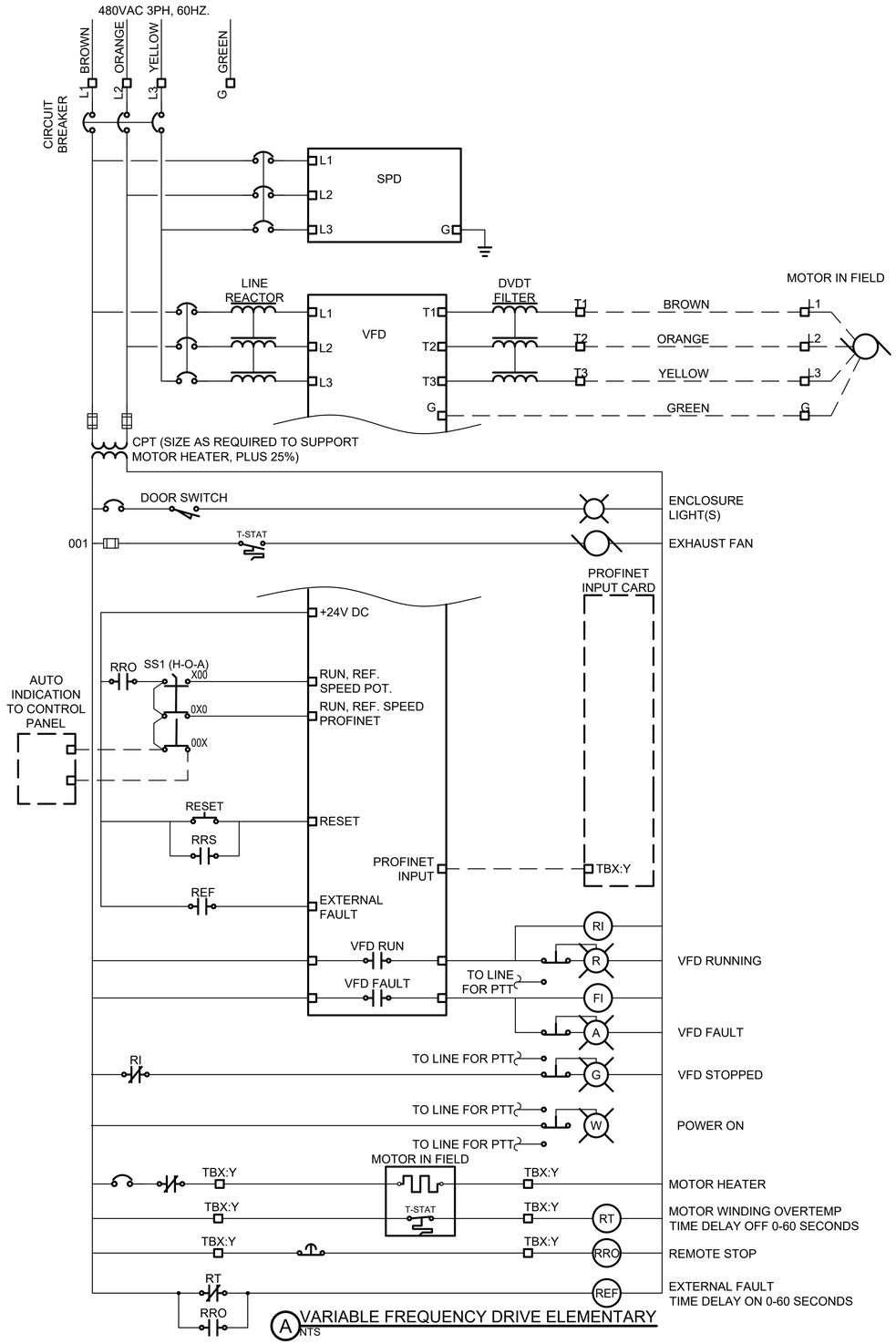
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

ELECTRICAL DETAILS

SHEET NO. 67
DWG NO. ED-0.4
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A VARIABLE FREQUENCY DRIVE ELEMENTARY
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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	L.BURNSIDE
DRAWN BY:	W.HILL
DATE:	JUNE 2026
CHECKED BY:	T.PRICE
DATE:	JUNE 2026

DESIGN ENGINEER
ANTONIO GONZALEZ JR., P.E.
FLORIDA REGISTRATION NO.
86300

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

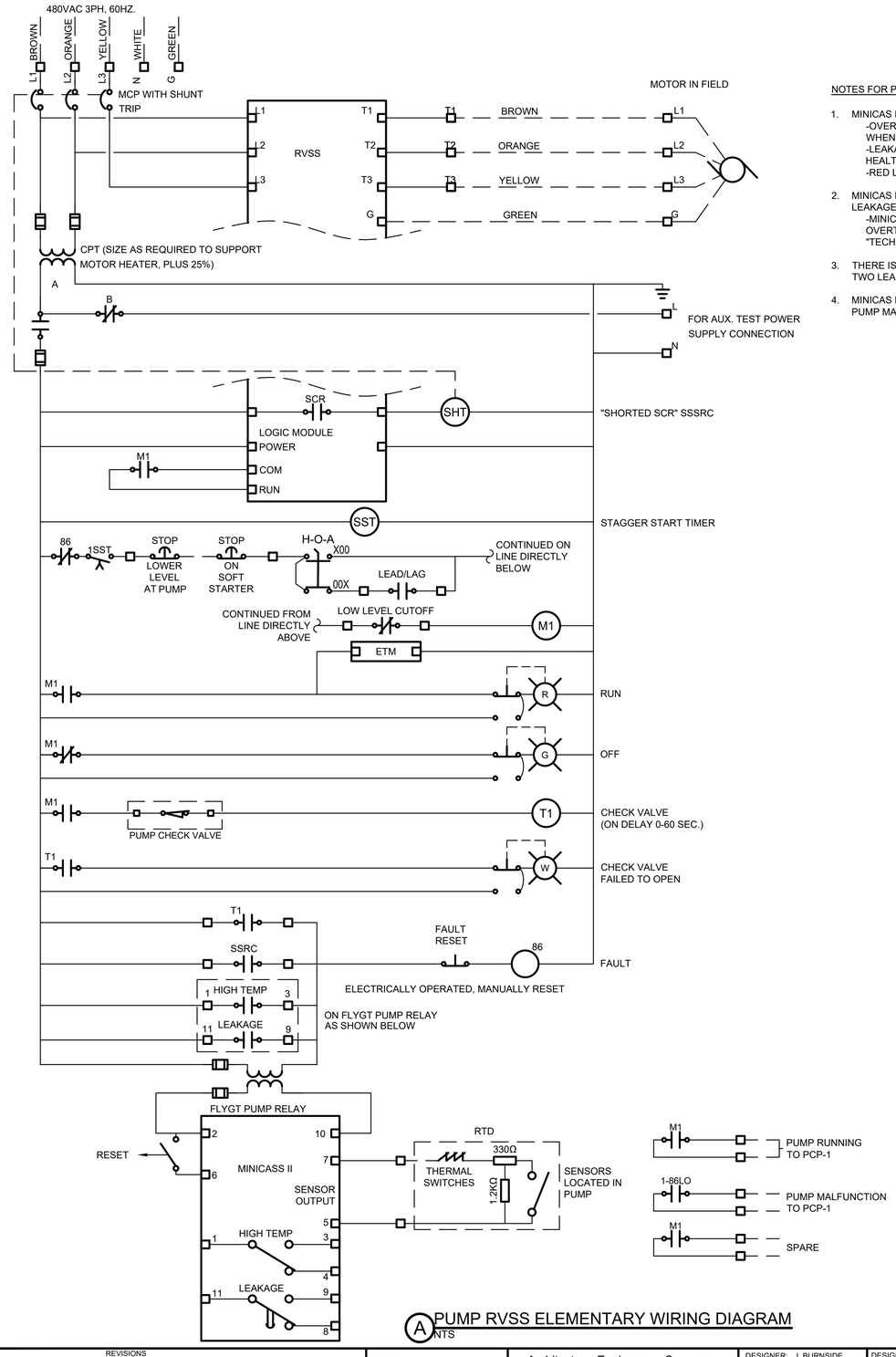
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

WIRING DETAILS

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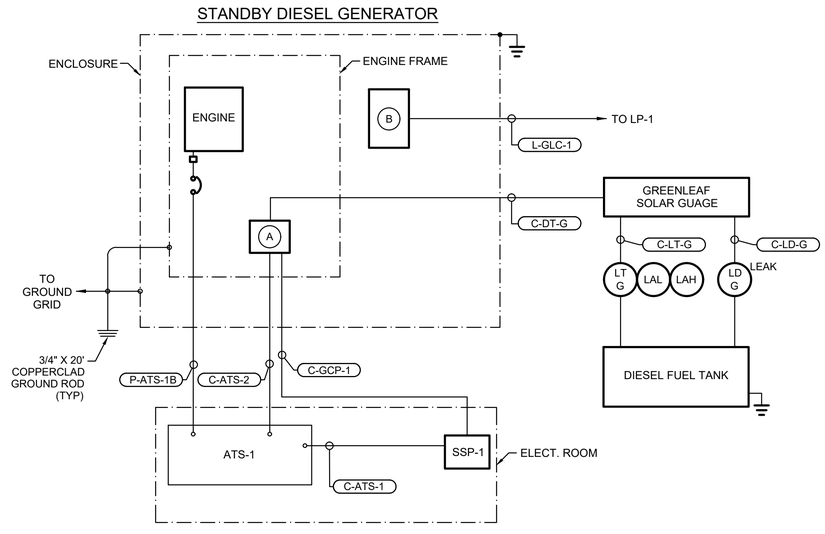
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A PUMP RVSS ELEMENTARY WIRING DIAGRAM
NTS

NOTES FOR PUMP RVSS ELEMENTARY DIAGRAM:

1. MINICAS II AMBER LED INDICATES SUPPLY ON.
   -OVERTEMPERATURE RELAY ENERGISED WHEN HEALTHY.
   -LEAKAGE RELAY DE-ENERGISED WHEN HEALTHY.
   -RED LEAKAGE LED OFF WHEN HEALTHY.
2. MINICAS II RESETS AUTOMATICALLY AFTER A LEAKAGE FAULT.
   -MINICAS II REQUIRES RESETTING AFTER OVERTEMPERATURE FAULT. PLEASE SEE "TECHNICAL DATA".
3. THERE IS NOT A SEPARATE INDICATION WHEN TWO LEAKAGE SENSORS ARE USED.
4. MINICAS II RELAY SHALL BE PROVIDED BY THE PUMP MANUFACTURER.



GENERATOR EQUIPMENT LEGEND

(A) GENERATOR CONTROL PANEL GCP-1. EQUIPPED WITH GREENLEAF DATA CONVERTER.

(B) 120/240V LOAD CENTER GLC-1. 60A, 2P MAIN BREAKER.

NOTES

1. LOAD CENTER GLC-1 PROVIDES POWER FOR BATTERY CHARGER, ENGINE HEATER, SPACE HEATER, ENCLOSURE LIGHTS AND RECEPTACLES PER SPECIFICATIONS.
2. THE FUEL STORAGE TANK SHALL BE EQUIPPED WITH A COMPLETE FUEL TANK LEVEL AND INTERSTITIAL LEAK MONITORING SYSTEM (SOLAR GAUGE MODEL EFG-8000).
3. THE GENERATOR CONTROL PANEL SHALL BE EQUIPPED WITH A FUEL STORAGE TANK LEVEL MONITOR DATA CONVERTER (SOLAR GAUGE MODEL EFC-420.1).

B GENERATOR ELECTRICAL WIRING DIAGRAM
NTS

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St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

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INSTRUMENT IDENTIFICATION LETTERS

	FIRST LETTER		SUCCEEDING LETTERS		
	MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS		ALARM OR PLC/DCS DISCRETE INPUT		
B	BURNER, COMBUSTION		USER'S CHOICE	USER'S CHOICE	BYPASS
C	CONDUCTIVITY (ELECTRICAL)			CONTROLLER	CLOSE
D	DENSITY (MASS) OR SPECIFIC GRAVITY	DIFFERENTIAL			DRIVE (VFD)
E	VOLTAGE (EMF)		(PRIMARY ELEMENT)		
F	FLOW RATE	RATIO (FRACTION)			
G	USER'S CHOICE				
H	HAND				HIGH
I	CURRENT (ELECTRICAL)		INDICATE		
J	POWER	SCAN			
K	TIME OR TIME-SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT (PILOT)		LOW
M	MOISTURE OR HUMIDITY	MOMENTARY			MIDDLE OR INTERMEDIATE
N	USER'S CHOICE		NOTIFY OR PLC/DCS DISCRETE INPUT	USER'S CHOICE	USER'S CHOICE
O	USER'S CHOICE		ORIFICE (RESTRICTION)		OPEN
P	PRESSURE OR VACUUM		POINT (TEST CONNECTION)		
Q	QUANTITY	INTEGRATE OR TOTALIZE			
R	RADIATION	REMOTE CONTROL	RECORD OR PRINT		
S	SPEED OR FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V	VIBRATION			VALVE, DAMPER OR LOUVER	
W	WEIGHT, TORQUE, OR FORCE		WELL		
X	PLC COMMAND		UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE OR PRESENCE			COMPUTE, CONVERT, RELAY	
Z	POSITION, DIMENSION, DIRECTION			DRIVE, ACTUATOR OR UNCLASSIFIED FINAL CONTROL ELEMENT	

INSTRUMENT AND FUNCTION SYMBOLS

	PRIMARY LOCATION NORMALLY ACCESSIBLE TO OPERATOR	FIELD MOUNT	AUXILIARY LOCATION NORMALLY ACCESSIBLE TO OPERATOR	NORMALLY INACCESSIBLE OR BEHIND THE PANEL DEVICES OR FUNCTIONS
DISCRETE INSTRUMENTS	XXX 000	XXX 000	XXX 000	XXX 000
SHARED DISPLAY, SHARED CONTROL (OIT, HMI)	XXX 000	XXX 000	XXX 000	XXX 000
PROGRAMMABLE LOGIC CONTROL	XXX 000	XXX 000	XXX 000	XXX 000
COMPUTER FUNCTION	XXX 000	XXX 000	XXX 000	XXX 000

XX — SUFFIX TO DIFFERENTIATE BETWEEN DIFFERENT INSTRUMENTATION DEVICES WITH THE SAME LOOP NUMBER AND INSTRUMENT IDENTIFICATION.

SINGLE INSTRUMENT OR OTHER COMPONENT HAVING MULTIPLE FUNCTIONS OR SHARING A COMMON HOUSING

(ZZZ) — DESIGNATIONS OF CONTROL FUNCTIONS (ZZZ) ASSOCIATED WITH INSTRUMENT OR OTHER COMPONENTS.

AHC	-	AUTO/HOLD/CLOSE	OSC	-	OPEN/STOP/CLOSED
AM	-	AUTO/MANUAL	POT	-	POTENTIOMETER
DEV	-	DEVIATION	RE	-	RESET
MOA	-	MANUAL/OFF/AUTO	RL	-	RAISE/LOWER
HOR	-	HAND/OFF/REMOTE	RS	-	RUN/STOP
LOS	-	LOCKOUT STOP	RSL	-	RAISE/STOP/LOWER
LR	-	LOCAL/REMOTE	SD	-	SHUTDOWN
00	-	ON / OFF	SEL	-	SELECT
OC	-	OPEN/CLOSE	SP	-	SET POINT
			SR	-	START/RESET
			SS	-	STOP/START

XXX 000 YY ZZ — PANEL MOUNTED PILOT LIGHT

DESIGNATIONS ASSOCIATED WITH PILOT LIGHTS:

FUNCTION (YY):	LENS/LAMP COLOR (ZZ):
F - FAULT	A - AMBER
R - RUNNING	G - GREEN
S - STOPPED	R - RED
## - PERCENT	W - WHITE

FYXX * — INSTRUMENT PANEL MOUNTED WITH COMPUTING OR CONVERTING FUNCTION

CONVERT */*

E - VOLTAGE	H - HYDRAULIC
I - CURRENT	O - ELECTROMAGNETIC, SONIC
P - PNEUMATIC	R - RESISTANCE (ELECT.)
A - ANALOG	D - DIGITAL
B - BINARY	

COMPUTE *

Σ	SUMMING	Σ/n	AVERAGING
—	SUBTRACTOR	I : I	RATIO
X	MULTIPLYING	Δ	DIFFERENCE
÷	DIVIDING	>	HIGH SELECTING
n√	ROOT EXTRACTION	<	LOW SELECTING
P	PROPORTIONAL	∫	INTEGRAL
R	DERIVATIVE	PID	PID

* ASTERISK IDENTIFIES FIELD INSTRUMENTS FURNISHED BY EQUIPMENT SUPPLIER

NON-ANALYTICAL FIELD INSTRUMENTS NOT IDENTIFIED BY SYMBOLS — XXX 000 TT

TT = R - RADAR
TD - THERMAL DISPERSION
RF - ADMITTANCE/CAPACITANCE

01103 / 01101 — BISECTED OCTAGON ADJACENT TO EQUIPMENT ITEM INDICATES THAT THE ELECTRICAL DEVICES (SWITCHES, CONTROL STATIONS, CONTROL PANELS, MCC COMPARTMENTS, WIRING, ETC.) OR SCADA DEVICES (I/O POINTS, HMI OBJECTS, ETC) FOR THE EQUIPMENT ITEM WITH THE LOOP NUMBER IN THE TOP OF THE HEXAGON ARE THE SAME AS THOSE FOR THE EQUIPMENT ITEM WITH THE LOOP NUMBER IN THE BOTTOM OF THE HEXAGON.

LINE SYMBOLS AND LEGEND

- DISCRETE ELECTRICAL SIGNAL (INPUTS) WITH INTERPOSING RELAYS (OUTPUTS)
- ANALOG ELECTRICAL SIGNAL WITH LIGHTNING SURGE ARRESTOR (INPUTS AND OUTPUTS)
- PROCESS/SIGNALS NOT CONNECTED (CROSSING)
- PROCESS/SIGNALS CONNECTED
- TERMINATION POINT(S) TO FUTURE EQUIPMENT
- FO — ETHERNET FIBER OPTIC CABLE
- CAT5 — CAT 5 CABLE
- PRIMARY PROCESS (MAJOR)
- SECONDARY PROCESS (MINOR)
- XX BAR7 — MAIN FLOW STREAM
- XX BAR4 — SECONDARY FLOW STREAM
- XX BAR1 — OTHER FLOW STREAM

CLOSED CONDUITS (DASHED LINE INDICATES ALTERNATE FLOW STREAM)

- XX — OPEN CHANNEL OR TANK FLOW STREAM

NOTE XX: FLOW STREAM IDENTIFICATION

- PACKAGE/SKID LIMITS
- INSTRUMENT OR PROCESS
- PNEUMATIC SIGNAL
- ELECTRIC SIGNAL
- HYDRAULIC SIGNAL
- CAPILLARY TUBE
- SOFTWARE OR DATA LINK
- BSS — ELECTROMAGNETIC OR SONIC SIGNAL
- INSTRUMENT SUPPLY OR CONNECTION TO PROCESS
  XX = ES-ELECTRICAL SUPPLY HS-HYDRAULIC SUPPLY GS-GAS SUPPLY (REFER TO FLOW STREAM IDENTIFICATION FOR OTHER TYPES)
- NN/XX BCONT1 — FLOW STREAM NO. NN TO SHEET NO. XX
- NN/XX — SIGNAL NO. NN FROM SHEET NO. XX
- X BCONT5 X — SIGNAL CONTINUATION ON SAME DRAWING. X = 1,2,3,ETC.
- BCONT3 — FLOW STREAM TO OR FROM EQUIPMENT NOT SHOWN ON OTHER DRAWINGS

ABBREVIATIONS

AG	ABOVE GROUND
ALM	ALARM
APU	AUXILIARY POWER UNIT
A/M	AUTO-MANUAL SELECTOR
AS	AIR SUPPLY
ASV	ANTI-SURGE VALVE
ASC	ANTI-SURGE CONTROLLER
ATM	ATMOSPHERE
ATS	AUTO TRANSFER SWITCH
BD	BLOW DOWN
BF	BLIND FLANGE
BIF	BURIED ISOLATING FLANGE
BG	BELOW GROUND
CC	CORROSION COUPON
CE	CORROSION COUPON/PROBE
CL	CLOSE
CS	CONE STRAINER
CSC	CAR SEAL CLOSED
CSO	CAR SEAL OPEN
DE	DE-ENERGIZE
DR	DRYER REGULATOR
EFM	ELECTRONIC FLOW MEASUREMENT
EL	ELEVATION
ES	ELECTRIC SUPPLY
ESD	EMERGENCY SHUTDOWN
(F)	FURNISHED WITH EQUIPMENT
FB	FULL BORE
FI	FAIL INTERMEDIATE
FE	FLANGED END
FC	FAIL CLOSED
FO	FAIL OPEN
FOR	FORWARD OFF REVERSE
FL	FAIL LAST
F/S	FAST SLOW SELECTOR
GOV	GAS OPERATED VALVE
GS	GAS SUPPLY
HOA	HAND-OFF-AUTOMATIC SELECTOR
IC	INSPECTION CLOSURE
IJ	INSULATING JOINT
INS	INSULATING
LB	LINE BREAK
LC	LOCKED CLOSED
LDT	LINE DESIGNATION TABLE
LE	LEVEL ELEMENT
L/L	LEAD LAG SELECTOR
LO	LOCKED OPEN
LPC	LOW PRESSURE CONTROLLER
L/R	LOCAL-REMOTE SELECTOR
LSA	LIGHTNING SURGE ARRESTOR
LSP	LOWER SET POINT
MAOP	MAXIMUM ALLOWABLE OPERATING PRESSURE
MCC	MOTOR CONTROL CENTER
MOP	MAXIMUM OPERATING PRESSURE
MSCP	MASTER STATION CONTROL PANEL
MW	MANWAY
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
OP	OPEN
O/C	OPEN-CLOSE SELECTOR
OSC	OPEN-STOP-CLOSE SELECTOR
PLC	PROGRAMMABLE LOGIC CONTROLLER
PLT-G	PILOT GAS
PG	POWER GAS
POS	POSITIONER
RA	REVERSE ACTING
RCP	REMOTE CONTROL PANEL
RCV	RECYCLE CONTROL VALVE
RO	RESTRICTION ORIFICE
ROC	FISHER ROC FLOW CONTROLLER
RTD	RESISTENCE TYPE TEMPERATURE ELEMENT
RTU	REMOTE TELEMETRY UNIT
RSP	RAISE SET POINT
SC	SAMPLE CONNECTION
SCADA	SUPERVISORY CONTROL AND DATA ACQUISITION
SCP	STATION CONTROL PANEL
SIR	STATION INTERFACE RACK
SP	SET POINT
SPFB	SET POINT FEEDBACK
SR	STRESS RELIEF
SSD	STATION SHUTDOWN
S/S	START-STOP SELECTOR
STA	STATION
TBG	TUBING
TP	TIE-IN POINT
TS	TEMPORARY STRAINER
T/T	TANGENT TO TANGENT
TYP	TYPICAL
UCP	UNIT CONTROL PANEL
USD	UNIT SHUTDOWN
VFD	VARIABLE FREQUENCY DRIVE
VTA	VENT TO ATMOSPHERE
W/	WITH

NOTES:

1. SYMBOLS AND NOMENCLATURE ARE BASED ON ISA STANDARDS S5.1, S5.2, S5.4
2. SEE ASSOCIATED ELECTRICAL AND MECHANICAL SYMBOL SHEETS FOR ADDITIONAL SYMBOLS AND ABBREVIATIONS.
3. POWER SUPPLIES FOR LOOPS OR SYSTEMS SHALL BE FURNISHED BY THE INSTRUMENTATION SUPPLIER TO MEET THE PARTICULAR CHARACTERISTICS (E.G. VOLTAGE AND CURRENT REQUIREMENTS) OF COMPONENTS IN EACH LOOP OR SYSTEM
4. X(S) REQUIRED FOR ALL EQUIPMENT TYPES LESS THAN FOUR CHARACTERS.

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86300

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
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INSTRUMENTATION LEGEND, ABBREVIATIONS AND NOTES

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VALVES

- GATE VALVE (UNDEFINED VALVE)
- KNIFE GATE VALVE
- BALL VALVE
- PLUG VALVE
- GLOBE VALVE
- CHECK VALVE
- NEEDLE VALVE
- BUTTERFLY VALVE
- EXCESS FLOW VALVE
- ANGLE VALVE
- DOUBLE BLOCK & BLEED VALVE
- 3-WAY VALVE
- 4-WAY VALVE
- BLOCK & BLEED VALVE (INSTRUMENT)
- PRESSURE RELIEF VALVE
- PRESSURE RELIEF VALVE
- VACUUM RELIEF VALVE
- PRESSURE AND VACUUM RELIEF VALVE
- WAFER-TYPE CHECK VALVE
- PUMP CONTROL VALVE
- BACKFLOW PREVENTOR
- PILOT OPERATED RELIEF VALVE
- RUPTURE DISC (PRESSURE)
- RUPTURE DISC (VACUUM)
- QUICK EXHAUST VALVE
- SHUTTLE VALVE
- SLUICE GATE
- AIR RELEASE VALVE
- PINCH VALVE
- BALL CHECK VALVE

VALVES (CONT.)

- ROTARY VALVE
- DIAPHRAGM VALVE
- THROUGH PLUG VALVE

VALVE CONNECTIONS

- THREADED
- FLANGED
- SOCKET WELD
- BUTT WELD

ACTUATORS

- SOLENOID
- SOLENOID WITH MANUAL RESET
- MOTOR ACTUATOR
- GAS ACTUATOR VALVE
- GAS-HYDRAULIC ACTUATOR
- ELECTROHYDRAULIC
- VALVE ACTUATOR ELECTRO- PNEUMATIC CONVERTER
- ELECTRO-HYDRAULIC ACTUATOR
- AIR-HYDRAULIC ACTUATOR
- HAND CONTROL
- DIAPHRAGM ACTUATOR
- PISTON OPERATED VALVE
- DIAPHRAGM ACTUATOR VALVE W/MANUAL OVERRIDE
- PRESSURE REDUCING REGULATOR W/EXTERNAL PRESSURE TAP
- BACK PRESSURE REGULATOR
- PRESSURE-REDUCING REGULATOR
- 3-WAY TEMPERATURE REGULATOR SELF CONTAINED
- DIAPHRAGM ACTUATOR W/POSITIONER
- 3-WAY PILOT OPERATED VALVE VENTS WHEN DE-ENERGIZED
- PISTON OPERATOR, SINGLE ACTING
- PISTON OPERATOR, DOUBLE ACTING

FLOW METERS

- FLOW SIGHT GLASS
- ORIFICE PLATE IN QUICK-CHANGE FITTING
- TURBINE METER
- PITOT TUBE OR PITOT-VENTURI TUBE
- POSITIVE DISPLACEMENT METER
- FLOW CONDITIONER
- FLOW NOZZLE
- ROTAMETER
- VORTEX METER
- AVERAGING PITOT TUBE (ANNUBAR)
- MASS FLOW (CORIOLIS)
- ULTRASONIC METER
- VENTURI TUBE
- RESTRICTION ORIFICE FLANGE SET
- FLUME
- WEIR
- MAG METER

MISC - PIPING

- REDUCER (CONCENTRIC)
- REDUCER (ECCENTRIC)
- SWAGE
- FLANGE
- BLIND FLANGE (DRILL & TAP)
- UNION
- INSULATING FLANGES
- INSULATING UNION
- INSULATING JOINT
- SPECTACLE BLIND (OPEN)

MISC (CONT.)

- SPECTACLE BLIND (CLOSED)
- WELD CAP
- THREADED CAP
- THREADED PLUG (ON VALVE)
- HOSE CONNECTION
- PIG SIGNAL
- CLAPPER TYPE VENT (RAIN CAP)
- BLOW OFF CLOSURE
- GOOSE NECK VENT
- SPACER
- FILTER OR BASKET STRAINER
- STRAINER ("Y" TYPE)
- STRAINER ("T" TYPE)
- TS = TEMPORARY STRAINER
CS = CONE STRAINER
- EXPANSION JOINT
- EXPANSION LOOP
- FLEXIBLE CONNECTION
- TEST RING W/VALVE (BLEED RING)
- BLANKING CAP
- NOZZLE
- MULTIPLE COUPLINGS AROUND PIPE
- COUPLING
- PIPE TAP
- TIE-IN POINT
- IDENTIFIES CHANGE SUCH AS SPEC ID, INSULATION MATERIAL, (ABOVE/BELOW GRADE SHOWN)
- STEAM OR DRAIN TRAP
- FILTER-DRYER (INSTRUMENT)

MISC (CONT.)

- FILTER-DRYER W/REGULATOR(S) [INSTRUMENT]
- FILTER (INSTRUMENT)
- THREE PORT NEEDLE VALVE
- FIVE PORT NEEDLE VALVE
- HORN
- THIEF HATCH
- SPECIALTY ITEM (THIEF HATCH SHOWN)
- CORROSION COUPON
- EQUIPMENT CONNECTION POINT
X = CONNECTION ID PER VENDOR DRAWINGS
- OPEN DRAIN
- BARRED TEE
- STOPPLE
- NODE FOR PFD ONLY
CORRESPONDS TO LDT
- THICKNESS
- INSULATION FUNCTION & MATERIAL (TABLES 12 & 13)
- INSULATED & HEAT TRACED PIPE
- HEAT TRACE TYPE (TABLE 14) [ELECTRICAL TRACE SHOWN]
- ROTARY FEEDER

LEVEL MEASUREMENT DEVICES

- FLOAT SWITCH
- ULTRASONIC LEVEL TRANSDUCER
- RADAR LEVEL TRANSDUCER

PUMPS/BLOWERS

- CENTRIFUGAL PUMP (UNDEFINED PUMP)
- CENTRIFUGAL BLOWER FAN
- SCREW PUMP
- PISTON PUMP

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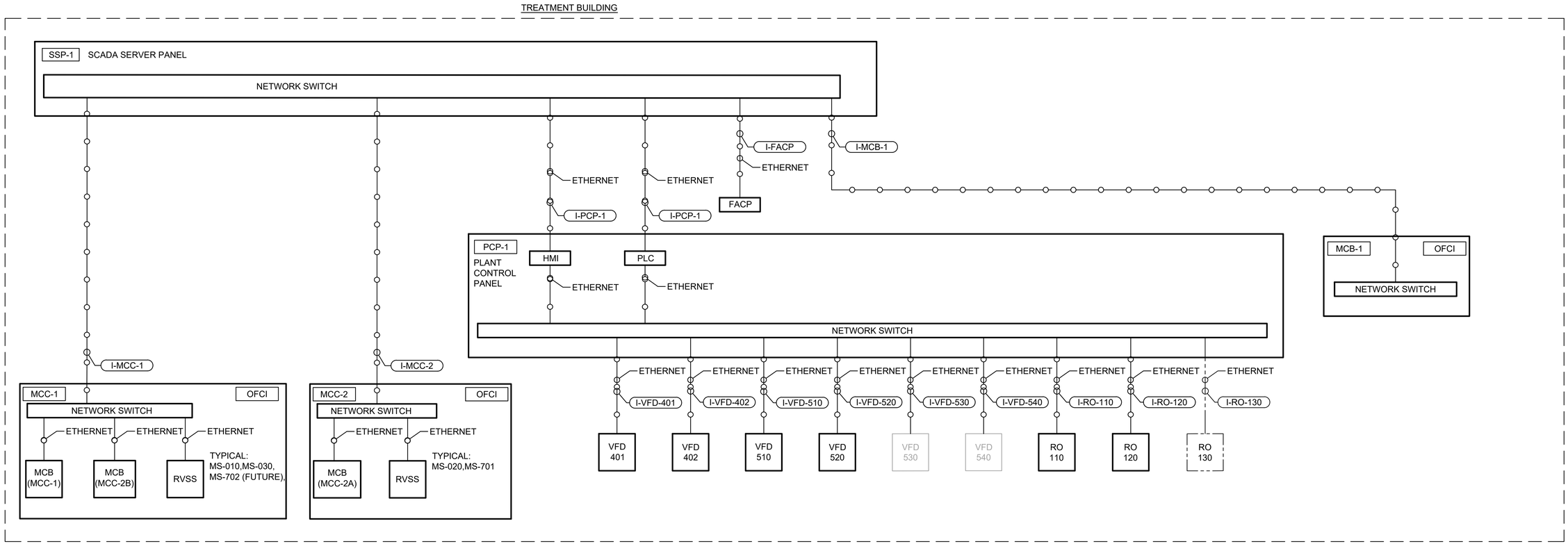
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GENERAL NOTES

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROCURING AND INSTALLING THE SSP-1 AND ALL ASSOCIATED EQUIPMENT.



NETWORK BLOCK DIAGRAM

NO SCALE

NO.	BY	DATE	SYMBOL	REVISIONS
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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	L.BURNSIDE
DRAWN BY:	W.HILL
DATE:	JUNE 2026
CHECKED BY:	T.PRICE
DATE:	JUNE 2026

DESIGN ENGINEER
ANTONIO GONZALEZ JR., P.E.
FLORIDA REGISTRATION NO.
86300

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

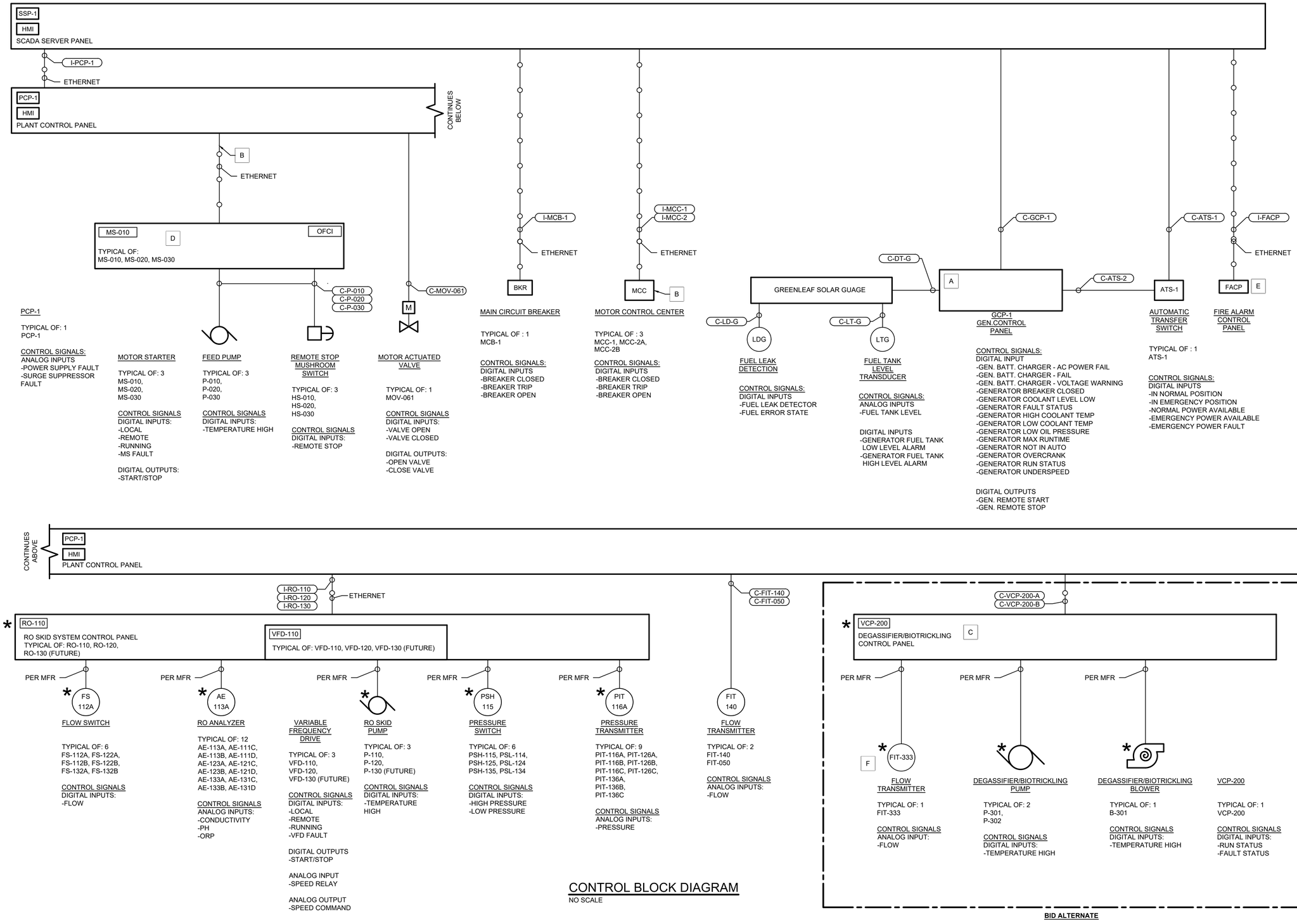
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

NETWORK BLOCK DIAGRAM

SHEET NO. 72
DWG NO. I-1.1
100% SUBMITTAL

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CONTROL BLOCK DIAGRAM

NO SCALE

GENERAL NOTES

1. COMPONENTS AND PANELS IDENTIFIED WITH AN ASTERISK (*) ARE PROVIDED AS PART OF A VENDOR-SUPPLIED PACKAGE SYSTEM. DRAWINGS ARE DIAGRAMMATIC AND INTENDED TO REPRESENT FUNCTIONAL INTENT ONLY. CONTRACTOR SHALL VERIFY ALL COMPONENTS, CONFIGURATION AND INSTALLATION REQUIREMENTS WITH THE EQUIPMENT VENDOR.

- KEY NOTES

A. GENERATOR CONTROL PANEL GCP-1 EQUIPPED WITH GREENLEAF CONVERTER.

B. ROUTE CONTROL SIGNALS VIA NETWORK CABLE IN CONDUIT I-MCC-1 AND I-MCC-2. SEE NETWORK BLOCK DIAGRAM.

C. CONTRACTOR SHALL COORDINATE WITH MANUFACTURER FOR ALL EQUIPMENT AND INSTRUMENTATION INFORMATION. ALL SIGNALS SHALL BE INTEGRATED INTO PCP-1 AND SSP-1. CONTRACTOR SHALL FOLLOW MANUFACTURERS DIRECTIONS FOR REQUIRED CONDUITS AND CONDUCTORS NOT ALREADY PROVIDED BY FACTORY.

D. MOTOR STARTER LOCATED IN MCC.

E. THE FIRE ALARM CONTROL PANEL (FACP) IS INCLUDED AS A DELEGATED DESIGN ITEM. REFER TO TREATMENT BUILDING FIRE ALARM PLAN SHEET FOR ADDITIONAL REQUIREMENTS.

F. ROUTE CONTROL SIGNAL VIA CABLE IN CONDUIT C-VCP-200-A TO PCP-1.

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Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	L.BURNSIDE
DRAWN BY:	W.HILL
DATE:	JUNE 2026
CHECKED BY:	T.PRICE
DATE:	JUNE 2026

DESIGN ENGINEER
ANTONIO GONZALEZ JR., P.E.
FLORIDA REGISTRATION NO.
86300

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

CONTROL BLOCK DIAGRAM

SHEET NO. 73
DWG NO. I-1.2
100% SUBMITTAL

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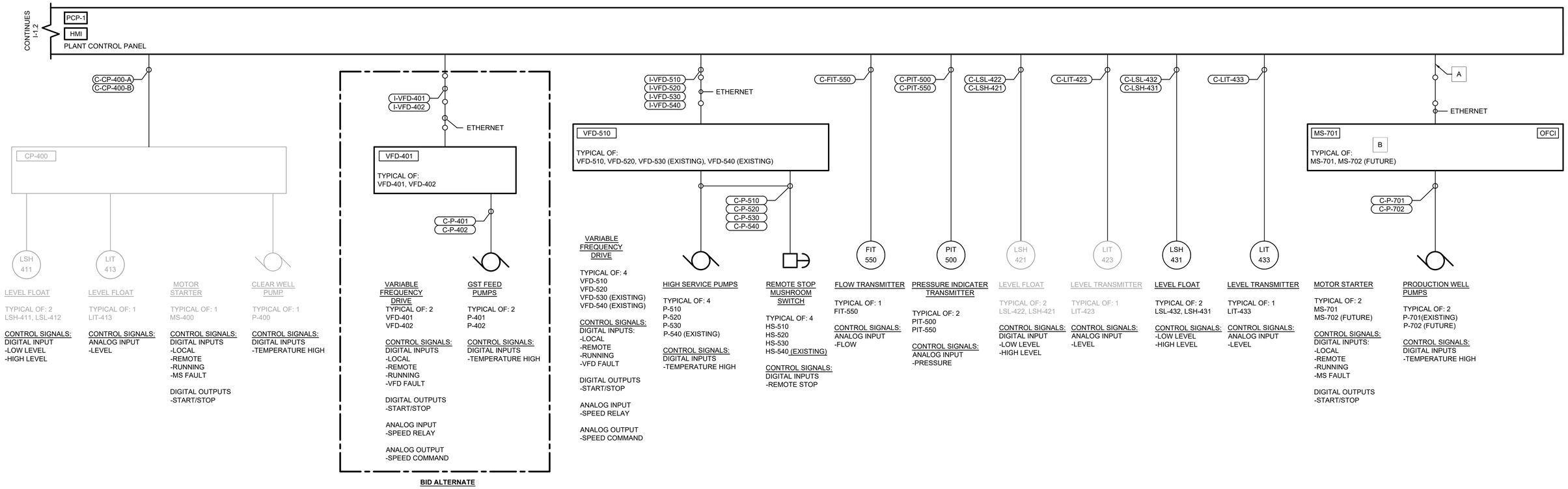
GENERAL NOTES

1. EXISTING EQUIPMENT IS BASED UPON AS-BUILT DATA AND THE ENGINEER CANNOT GUARANTEE ITS ACCURACY. CONTRACTOR SHALL VERIFY EXISTING EQUIPMENT FOR RE-TERMINATION.

[-] KEY NOTES

A. ROUTE CONTROL SIGNALS VIA NETWORK CABLE IN CONDUIT I-MCC-1 AND I-MCC-2. SEE NETWORK BLOCK DIAGRAM

B. MOTOR STARTER LOCATED IN MCC.



CONTROL BLOCK DIAGRAM

NO SCALE

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Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	L.BURNSIDE
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DESIGN ENGINEER
ANTONIO GONZALEZ JR., P.E.
FLORIDA REGISTRATION NO.
86300

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

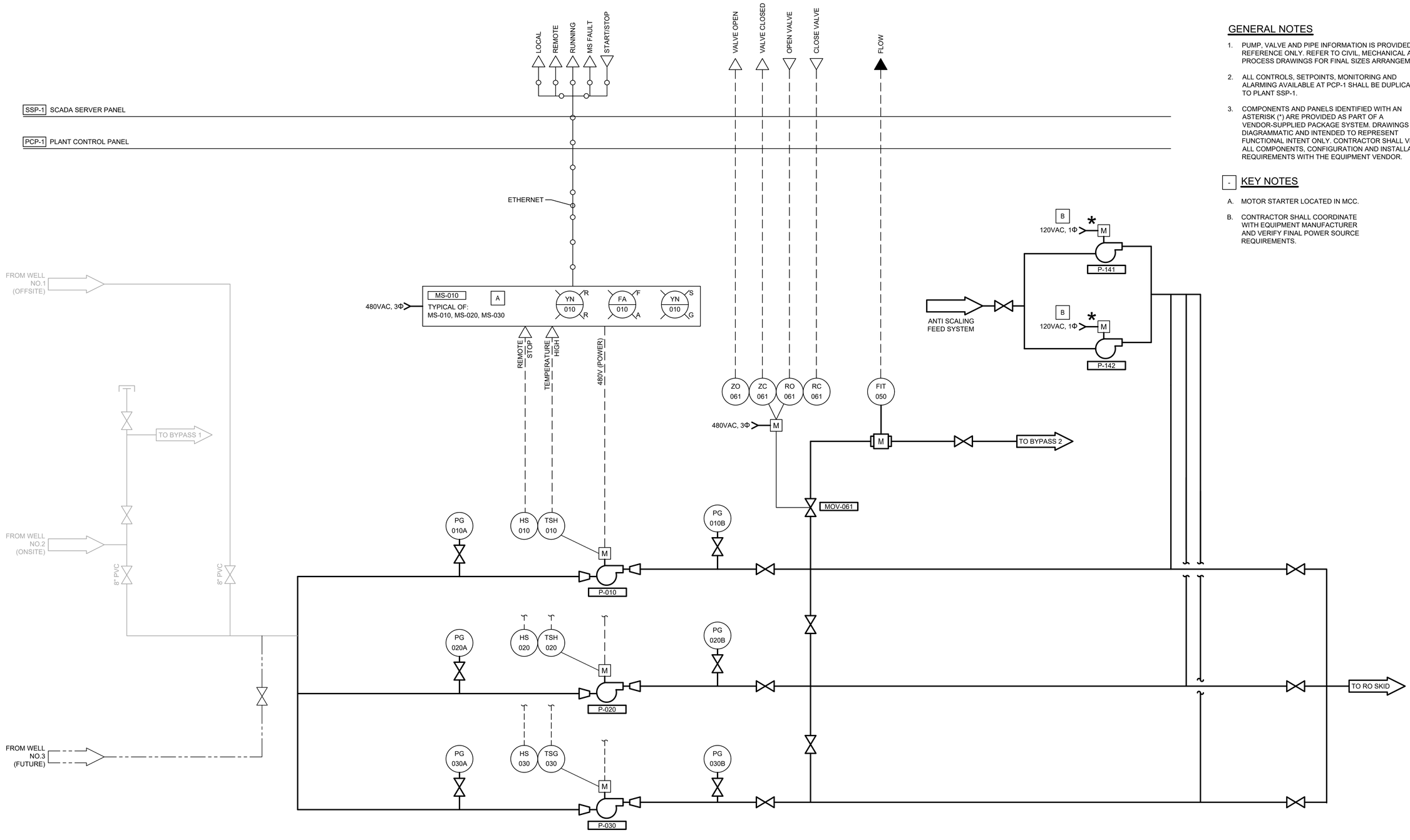
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

CONTROL BLOCK DIAGRAM

SHEET NO. 74
DWG NO. I-1.3
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GENERAL NOTES

1. PUMP, VALVE AND PIPE INFORMATION IS PROVIDED AS REFERENCE ONLY. REFER TO CIVIL, MECHANICAL AND PROCESS DRAWINGS FOR FINAL SIZES ARRANGEMENT.
2. ALL CONTROLS, SETPOINTS, MONITORING AND ALARMING AVAILABLE AT PCP-1 SHALL BE DUPLICATED TO PLANT SSP-1.
3. COMPONENTS AND PANELS IDENTIFIED WITH AN ASTERISK (*) ARE PROVIDED AS PART OF A VENDOR-SUPPLIED PACKAGE SYSTEM. DRAWINGS ARE DIAGRAMMATIC AND INTENDED TO REPRESENT FUNCTIONAL INTENT ONLY. CONTRACTOR SHALL VERIFY ALL COMPONENTS, CONFIGURATION AND INSTALLATION REQUIREMENTS WITH THE EQUIPMENT VENDOR.

- KEY NOTES

A. MOTOR STARTER LOCATED IN MCC.

B. CONTRACTOR SHALL COORDINATE WITH EQUIPMENT MANUFACTURER AND VERIFY FINAL POWER SOURCE REQUIREMENTS.

PROCESS AND INSTRUMENTATION DIAGRAM

NO SCALE

NO.	BY	DATE	SYMBOL	REVISIONS
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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	L.BURNSIDE
DRAWN BY:	W.HILL
DATE:	JUNE 2026
CHECKED BY:	T.PRICE
DATE:	JUNE 2026

DESIGN ENGINEER
ANTONIO GONZALEZ JR., P.E.
FLORIDA REGISTRATION NO.
86300

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

RO FEED PUMPS
PROCESS AND INSTRUMENTATION
DIAGRAM

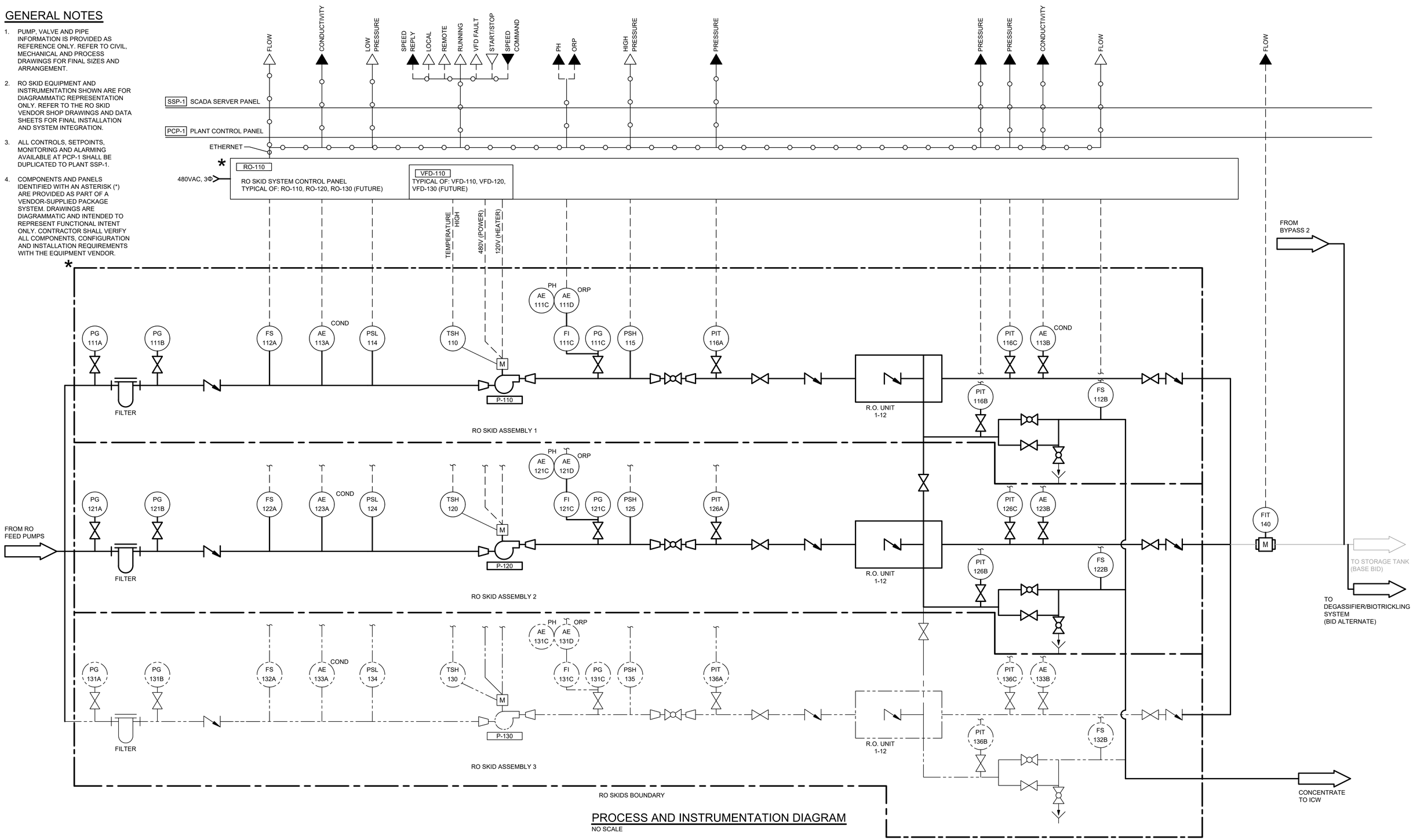
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DWG NO.	I-2.1
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GENERAL NOTES

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2. RO SKID EQUIPMENT AND INSTRUMENTATION SHOWN ARE FOR DIAGRAMMATIC REPRESENTATION ONLY. REFER TO THE RO SKID VENDOR SHOP DRAWINGS AND DATA SHEETS FOR FINAL INSTALLATION AND SYSTEM INTEGRATION.
3. ALL CONTROLS, SETPOINTS, MONITORING AND ALARMING AVAILABLE AT PCP-1 SHALL BE DUPLICATED TO PLANT SSP-1.
4. COMPONENTS AND PANELS IDENTIFIED WITH AN ASTERISK (*) ARE PROVIDED AS PART OF A VENDOR-SUPPLIED PACKAGE SYSTEM. DRAWINGS ARE DIAGRAMMATIC AND INTENDED TO REPRESENT FUNCTIONAL INTENT ONLY. CONTRACTOR SHALL VERIFY ALL COMPONENTS, CONFIGURATION AND INSTALLATION REQUIREMENTS WITH THE EQUIPMENT VENDOR.



PROCESS AND INSTRUMENTATION DIAGRAM

NO SCALE

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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	L.BURNSIDE
DRAWN BY:	W.HILL
DATE:	JUNE 2026
CHECKED BY:	T.PRICE
DATE:	JUNE 2026

DESIGN ENGINEER
ANTONIO GONZALEZ JR., P.E.
FLORIDA REGISTRATION NO.
86300

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

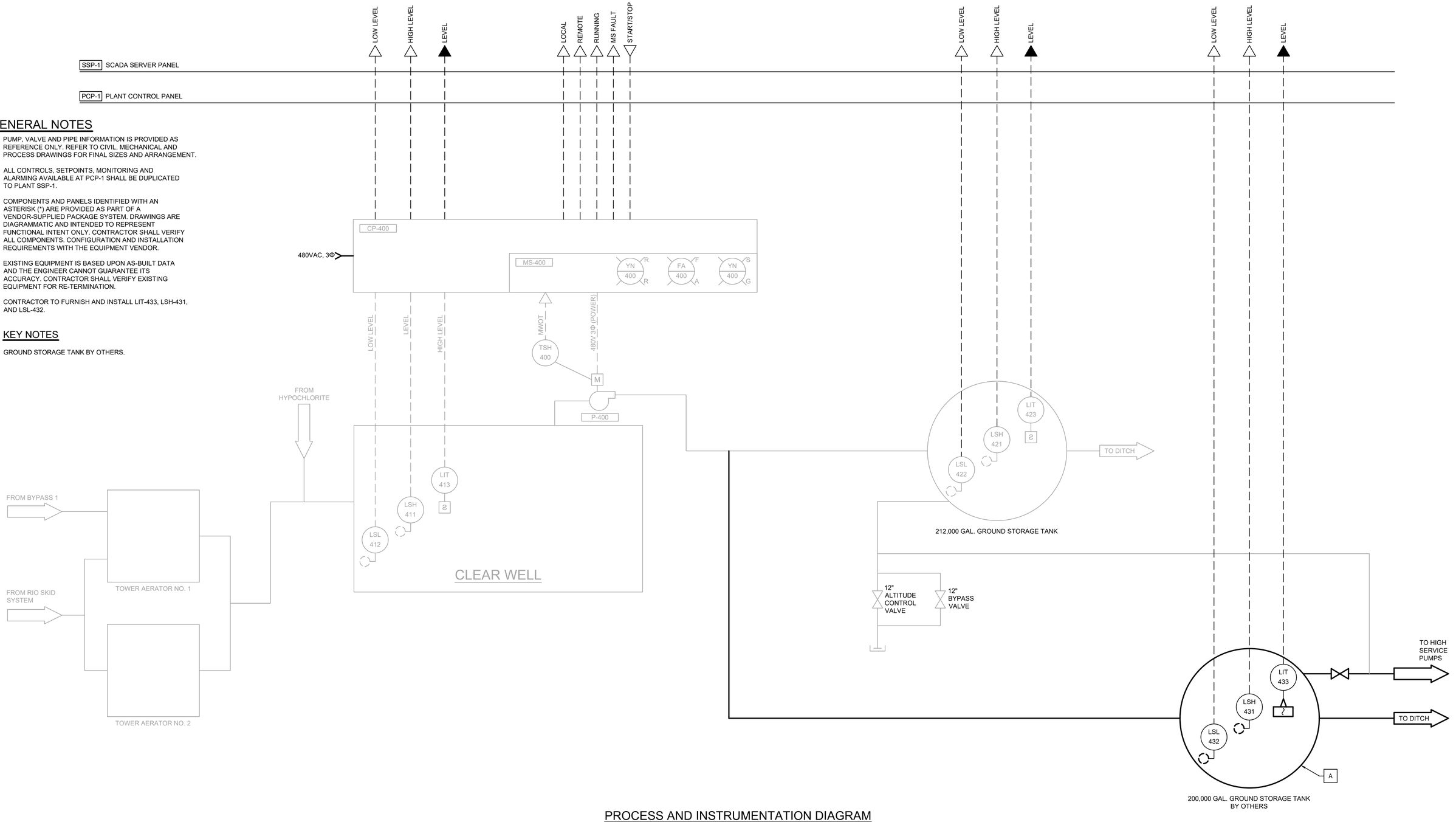
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

RO SKID SYSTEM
PROCESS AND INSTRUMENTATION
DIAGRAM

SHEET NO. 76
DWG NO. I-2.2
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4. EXISTING EQUIPMENT IS BASED UPON AS-BUILT DATA AND THE ENGINEER CANNOT GUARANTEE ITS ACCURACY. CONTRACTOR SHALL VERIFY EXISTING EQUIPMENT FOR RE-TERMINATION.
5. CONTRACTOR TO FURNISH AND INSTALL LIT-433, LSH-431, AND LSL-432.

- KEY NOTES

A. GROUND STORAGE TANK BY OTHERS.

PROCESS AND INSTRUMENTATION DIAGRAM

NO SCALE

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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER: L.BURNSIDE
DRAWN BY: W.HILL
DATE: JUNE 2026
CHECKED BY: T.PRICE
DATE: JUNE 2026

DESIGN ENGINEER
ANTONIO GONZALEZ JR., P.E.
FLORIDA REGISTRATION NO.
86300

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

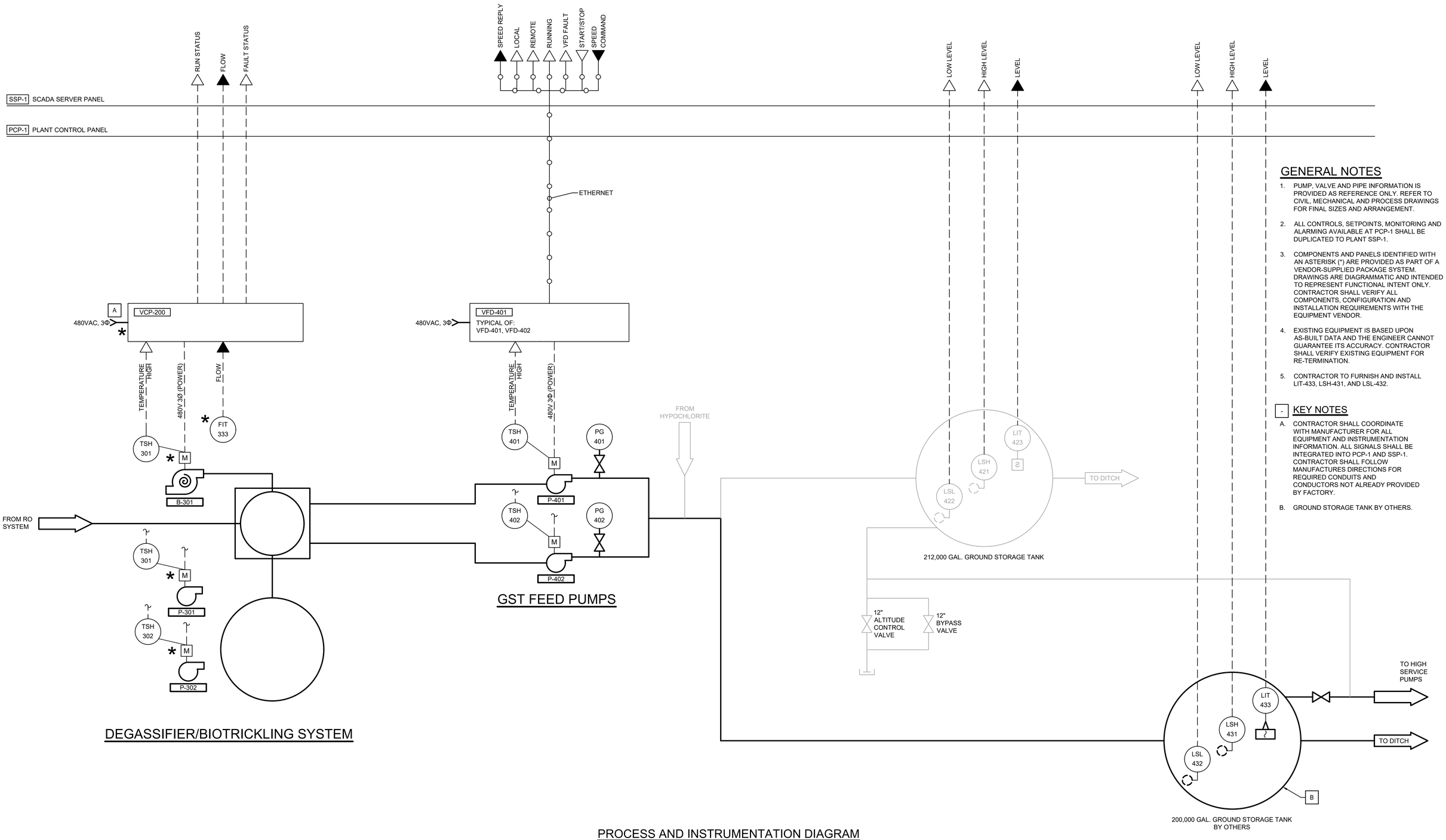
STORAGE TANK
PROCESS AND INSTRUMENTATION
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100% SUBMITTAL

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DEGASSIFIER/BIOTRICKLING SYSTEM

GST FEED PUMPS

PROCESS AND INSTRUMENTATION DIAGRAM

NO SCALE

GENERAL NOTES

1. PUMP, VALVE AND PIPE INFORMATION IS PROVIDED AS REFERENCE ONLY. REFER TO CIVIL, MECHANICAL AND PROCESS DRAWINGS FOR FINAL SIZES AND ARRANGEMENT.
2. ALL CONTROLS, SETPOINTS, MONITORING AND ALARMING AVAILABLE AT PCP-1 SHALL BE DUPLICATED TO PLANT SSP-1.
3. COMPONENTS AND PANELS IDENTIFIED WITH AN ASTERISK (*) ARE PROVIDED AS PART OF A VENDOR-SUPPLIED PACKAGE SYSTEM. DRAWINGS ARE DIAGRAMMATIC AND INTENDED TO REPRESENT FUNCTIONAL INTENT ONLY. CONTRACTOR SHALL VERIFY ALL COMPONENTS, CONFIGURATION AND INSTALLATION REQUIREMENTS WITH THE EQUIPMENT VENDOR.
4. EXISTING EQUIPMENT IS BASED UPON AS-BUILT DATA AND THE ENGINEER CANNOT GUARANTEE ITS ACCURACY. CONTRACTOR SHALL VERIFY EXISTING EQUIPMENT FOR RE-TERMINATION.
5. CONTRACTOR TO FURNISH AND INSTALL LIT-433, LSH-431, AND LSL-432.

- KEY NOTES

A. CONTRACTOR SHALL COORDINATE WITH MANUFACTURER FOR ALL EQUIPMENT AND INSTRUMENTATION INFORMATION. ALL SIGNALS SHALL BE INTEGRATED INTO PCP-1 AND SSP-1. CONTRACTOR SHALL FOLLOW MANUFACTURES DIRECTIONS FOR REQUIRED CONDUITS AND CONDUCTORS NOT ALREADY PROVIDED BY FACTORY.

B. GROUND STORAGE TANK BY OTHERS.

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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	L.BURNSIDE
DRAWN BY:	W.HILL
DATE:	JUNE 2026
CHECKED BY:	T.PRICE
DATE:	JUNE 2026

DESIGN ENGINEER
ANTONIO GONZALEZ JR., P.E.
FLORIDA REGISTRATION NO.
86300

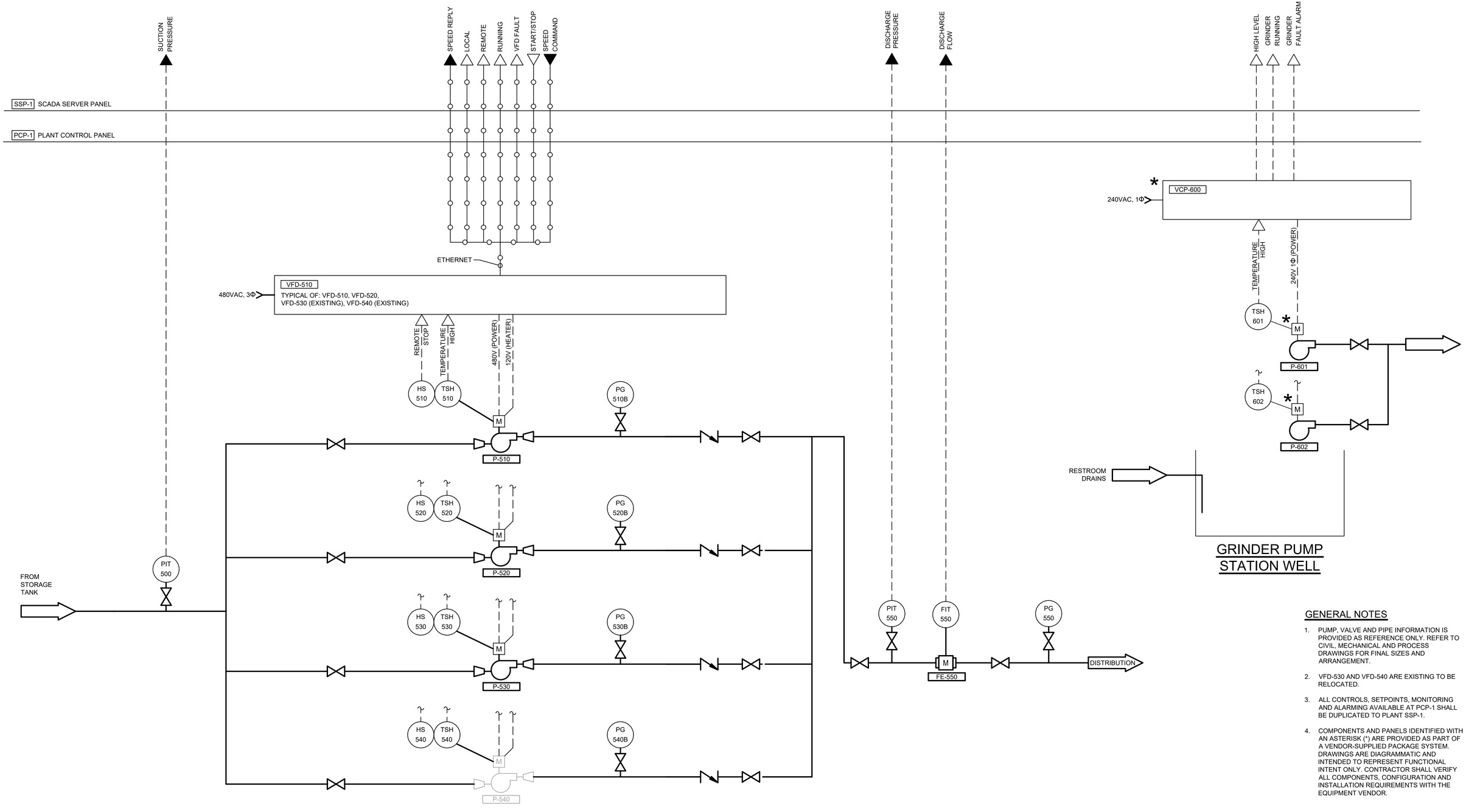
St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

DEGASSIFIER/BIOTRICKLING SYSTEM
PROCESS AND INSTRUMENTATION
DIAGRAM BID ALTERNATE

SHEET NO. 78
DWG NO. I-2.4
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GRINDER PUMP STATION WELL

GENERAL NOTES

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2. VFD-530 AND VFD-540 ARE EXISTING TO BE RELOCATED.
3. ALL CONTROLS, SETPOINTS, MONITORING AND ALARMING AVAILABLE AT PCP-1 SHALL BE DUPLICATED TO PLANT SSP-1.
4. COMPONENTS AND PANELS IDENTIFIED WITH AN ASTERISK (*) ARE PROVIDED AS PART OF A VENDOR-SUPPLIED PACKAGE SYSTEM. DRAWINGS ARE DIAGRAMMATIC AND INTENDED TO REPRESENT FUNCTIONAL INTENT ONLY. CONTRACTOR SHALL VERIFY ALL COMPONENTS, CONFIGURATION AND INSTALLATION REQUIREMENTS WITH THE EQUIPMENT VENDOR.

PROCESS AND INSTRUMENTATION DIAGRAM

NO SCALE

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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	L.BURNSIDE
DRAWN BY:	W.HILL
DATE:	JUNE 2026
CHECKED BY:	T.PRICE
DATE:	JUNE 2026

DESIGN ENGINEER
ANTONIO GONZALEZ JR., P.E.
FLORIDA REGISTRATION NO.
86300

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

HIGH SERVICE PUMPS
PROCESS AND INSTRUMENTATION
DIAGRAM

SHEET NO. 79
DWG NO. I-2.5
100% SUBMITTAL

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EQUIPMENT ID TAG	LOOP IDENTIFICATION NO.	DESCRIPTION	SIGNAL TYPE	SPARE?	SIGNAL ACQUISITION	DISPLAY OR COMMAND ENERGIZED	DISPLAY OR COMMAND DE-ENERGIZED	HMI ALARM	DIAL OUT ALARM	TREND	HIST.	ENCLOSURE	RACK	SLOT	POINT	TB#	TB PT#
AE-111C	AE-111C	PH	AI	IN USE	HARDWIRE		N/A			X	X	RO-110					
AE-111D	AE-111D	ORP	AI	IN USE	HARDWIRE		N/A			X	X	RO-110					
AE-113A	AE-113A	CONDUCTIVITY	AI	IN USE	HARDWIRE		N/A			X	X	RO-110					
AE-113B	AE-113B	CONDUCTIVITY	AI	IN USE	HARDWIRE		N/A			X	X	RO-110					
AE-121C	AE-121C	PH	AI	IN USE	HARDWIRE		N/A			X	X	RO-120					
AE-121D	AE-121D	ORP	AI	IN USE	HARDWIRE		N/A			X	X	RO-120					
AE-123A	AE-123A	CONDUCTIVITY	AI	IN USE	HARDWIRE		N/A			X	X	RO-120					
AE-123B	AE-123B	CONDUCTIVITY	AI	IN USE	HARDWIRE		N/A			X	X	RO-120					
AE-131C	AE-131C	PH	AI	IN USE	HARDWIRE		N/A			X	X	RO-130					
AE-131D	AE-131D	ORP	AI	IN USE	HARDWIRE		N/A			X	X	RO-130					
AE-133A	AE-133A	CONDUCTIVITY	AI	IN USE	HARDWIRE		N/A			X	X	RO-130					
AE-133B	AE-133B	CONDUCTIVITY	AI	IN USE	HARDWIRE		N/A			X	X	RO-130					
ATS-1	JA-1	NORMAL POWER AVAILABLE	DI	IN USE	HARDWIRE	UTIL. AVAIL.	N/A					SSP-1					
ATS-1	JA-1	EMERGENCY POWER AVAILABLE	DI	IN USE	HARDWIRE	GEN. AVAIL	N/A	X				SSP-1					
ATS-1	JP-1	NORMAL POSITION	DI	IN USE	HARDWIRE	NORMAL	N/A					SSP-1					
ATS-1	JP-1	EMERGENCY POSITION	DI	IN USE	HARDWIRE	EMERGENCY	N/A					SSP-1					
ATS-1	FA-1	EMERGENCY POWER FAULT	DI	IN USE	HARDWIRE	FAULT	OK	X				SSP-1					
VCP-600	YA-600	GRINDER FAULT ALARM	DI	IN USE	HARDWIRE	FAULT	OK	X				PCP-1					
VCP-600	YS-600	GRINDER RUN STATUS	DI	IN USE	HARDWIRE	RUNNING	STOPPED	X				PCP-1					
VCP-600	LAH-600	GRINDER HIGH LEVEL ALARM	DI	IN USE	HARDWIRE	HIGH LEVEL	OK	X				PCP-1					
VCP-200	YA-200	FAULT STATUS	DI	IN USE	HARDWIRE	FAULT	OK	X				PCP-1					
VCP-200	YS-200	RUN STATUS	DI	IN USE	HARDWIRE	RUNNING	STOPPED	X				PCP-1					
CP-400	YA-400	FAULT STATUS	DI	IN USE	HARDWIRE	FAULT	OK	X				PCP-1					
CP-400	YS-400	RUN STATUS	DI	IN USE	HARDWIRE	RUNNING	STOPPED	X				PCP-1					
CP-400	HAS-400	REMOTE STATUS	DI	IN USE	HARDWIRE	IN REMOTE		X				PCP-1					
CP-400	XR-400	START/STOP COMMAND	DO	IN USE	HARDWIRE							PCP-1					
CP-400	HSH-400	LOCAL STATUS	DI	IN USE	HARDWIRE	IN LOCAL		X				PCP-1					
CP-400	LAH-400	HIGH LEVEL	DI	IN USE	HARDWIRE	HIGH LEVEL	OK	X				PCP-1					
CP-400	LAL-400	LOW LEVEL	DI	IN USE	HARDWIRE	LOW LEVEL	OK	X				PCP-1					
CP-400	LI-400	LEVEL	AI	IN USE	HARDWIRE		N/A	X				PCP-1					
B-301	TAH-301	TEMPERATURE HIGH	DI	IN USE	HARDWIRE	NORMAL	HIGH TEMP	X				PCP-1					
FIT-140	FI-140	FEED FLOW	AI	IN USE	HARDWIRE		N/A			X	X	PCP-1					
FIT-550	FI-550	DISCHARGE FLOW	AI	IN USE	HARDWIRE		N/A			X	X	PCP-1					
FIT-050	FI-050	FLOW	AI	IN USE	HARDWIRE		N/A			X	X	PCP-1					
FIT-333	FI-333	FLOW	AI	IN USE	HARDWIRE		N/A			X	X	PCP-1					
FS-112A	FS-112A	FLOW	DI	IN USE	HARDWIRE	NORMAL	N/A			X	X	RO-110					
FS-112B	FS-112B	FLOW	DI	IN USE	HARDWIRE	NORMAL	N/A			X	X	RO-110					
FS-122A	FS-122A	FLOW	DI	IN USE	HARDWIRE	NORMAL	N/A			X	X	RO-120					
FS-122B	FS-122B	FLOW	DI	IN USE	HARDWIRE	NORMAL	N/A			X	X	RO-120					
FS-132B	FS-132B	FLOW	DI	IN USE	HARDWIRE	NORMAL	N/A			X	X	RO-130					
GCP-1	EA-1	GEN. BATT. CHARGER-VOLTAGE WARNING	DI	IN USE	HARDWIRE	WARNING	OK	X				SSP-1					
GCP-1	JA-1	GEN. BATT. CHARGER-AC POWER FAIL	DI	IN USE	HARDWIRE	AC FAILURE	OK	X				SSP-1					
GCP-1	KI-1	GEN. MAX RUNTIME	DI	IN USE	HARDWIRE	MAX RUNTIME	OK	X				SSP-1					
GCP-1	LAL-1	GEN. COOLANT LEVEL LOW	DI	IN USE	HARDWIRE	LOW COOLANT LEVEL	OK	X				SSP-1					
GCP-1	MA-1	GEN. OVERCRANK	DI	IN USE	HARDWIRE	FAULT	OK	X				SSP-1					
GCP-1	PAL-1	GEN. LOW OIL PRESSURE	DI	IN USE	HARDWIRE	LOW OIL PRESSURE	OK	X				SSP-1					
GCP-1	RA-1	GEN. RUN STATUS	DI	IN USE	HARDWIRE	RUNNING	STOPPED	X				SSP-1					
GCP-1	SA-1	GEN. UNDERSPEED	DI	IN USE	HARDWIRE	UNDERSPEED	OK	X				SSP-1					
GCP-1	TAH-1	GEN. HIGH COOLANT TEMP	DI	IN USE	HARDWIRE	COOLANT TEMP HIGH	OK	X				SSP-1					
GCP-1	TAL-1	GEN. LOW COOLANT TEMP	DI	IN USE	HARDWIRE	COOLANT TEMP LOW	OK	X				SSP-1					
GCP-1	YA-1	GEN. BATT. CHARGER-FAIL	DI	IN USE	HARDWIRE	FAULT	OK	X				SSP-1					
GCP-1	YI-1	GEN. FAULT STATUS	DI	IN USE	HARDWIRE	FAULT	OK	X				SSP-1					
GCP-1	ZC-1	GEN. BREAKER CLOSED	DI	IN USE	HARDWIRE	CLOSED	OPEN	X				SSP-1					
GCP-1	ZI-1	GEN. NOT IN AUTO	DI	IN USE	HARDWIRE	NOT IN AUTO	IN AUTO	X				SSP-1					
GCP-1	XS-1	GENERATOR REMOTE STOP	DO	IN USE	HARDWIRE	REMOTE STOP	OK	X				SSP-1					
GCP-1	XR-1	GENERATOR REMOTE START	DO	IN USE	HARDWIRE	REMOTE START	OK	X				SSP-1					
GCP-1	XS-1	GENERATOR REMOTE STOP	DO	IN USE	HARDWIRE	REMOTE STOP	OK	X				ATS-1					
GCP-1	XR-1	GENERATOR REMOTE START	DO	IN USE	HARDWIRE	REMOTE START	OK	X				ATS-1					
GCP-1	JA-1	EMERGENCY POWER AVAILABLE	DI	IN USE	HARDWIRE	GEN. AVAIL	N/A	X				ATS-1					
GCP-1	FA-1	EMERGENCY POWER FAULT	DI	IN USE	HARDWIRE	FAULT	OK	X				ATS-1					

I/O LIST

NO SCALE

NO.	BY	DATE	SYMBOL	REVISIONS
6.				
5.				
4.				
3.				
2.				
1.				

MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	L.BURNSIDE
DRAWN BY:	W.HILL
DATE:	JUNE 2026
CHECKED BY:	T.PRICE
DATE:	JUNE 2026

DESIGN ENGINEER
ANTONIO GONZALEZ JR., P.E.
FLORIDA REGISTRATION NO.
86300

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

I/O LIST

SHEET NO. 80
DWG NO. I-3.1
100% SUBMITTAL

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Xrefs Attached= SJCUD_22X34_BOR-E [..\Xrefs\SJCUD_22X34_BOR-E.dwg]
SJCUD_22X34_BOR [..\Xrefs\SJCUD_22X34_BOR.dwg]
X-Schedules [..\Xrefs\X-Schedules.dwg]
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EQUIPMENT ID TAG	LOOP IDENTIFICATION NO.	DESCRIPTION	SIGNAL TYPE	SPARE?	SIGNAL ACQUISITION	DISPLAY OR COMMAND ENERGIZED	DISPLAY OR COMMAND DE-ENERGIZED	HMI ALARM	DIAL OUT ALARM	TREND	HIST.	ENCLOSURE	RACK	SLOT	POINT	TB#	TB PT#
LD-G	YI-G	GENERATOR FUEL LEAK DETECTION ERROR	DI	IN USE	HARDWIRE	ERROR	OK	X				GCP-1					
LD-G	YI-G	GENERATOR FUEL LEAK DETECTION	DI	IN USE	HARDWIRE	LEAK	OK	X				GCP-1					
LT-G	LAH-G	GENERATOR FUEL HIGH LEVEL ALARM	DI	IN USE	HARDWIRE	HIGH LEVEL	OK	X				GCP-1					
LT-G	LAL-G	GENERATOR FUEL TANK LOW LEVEL ALARM	DI	IN USE	HARDWIRE	LOW LEVEL	OK	X		X	X	GCP-1					
LIT-G	LI-G	GENERATOR FUEL TANK LEVEL	AI	IN USE	HARDWIRE	0-100%	N/A	X				GCP-1					
LIT-423	LI-423	LEVEL	AI	IN USE	HARDWIRE		N/A	X				PCP-1					
LIT-433	LI-433	LEVEL	AI	IN USE	HARDWIRE		N/A	X				PCP-1					
LIT-413	LI-413	LEVEL	AI	IN USE	HARDWIRE		N/A	X				PCP-1					
LSH-421	LAH-421	HIGH LEVEL	DI	IN USE	HARDWIRE	HIGH LEVEL	OK	X				PCP-1					
LSH-411	LAH-411	HIGH LEVEL	DI	IN USE	HARDWIRE	HIGH LEVEL	OK	X				PCP-1					
LSH-431	LAH-431	HIGH LEVEL	DI	IN USE	HARDWIRE	HIGH LEVEL	OK	X				PCP-1					
LSL-422	LAL-422	LOW LEVEL	DI	IN USE	HARDWIRE	LOW LEVEL	OK	X				PCP-1					
LSL-432	LAL-432	LOW LEVEL	DI	IN USE	HARDWIRE	LOW LEVEL	OK	X				PCP-1					
LSL-412	LAL-412	LOW LEVEL	DI	IN USE	HARDWIRE	LOW LEVEL	OK	X				PCP-1					
MOV-061	ZO-061	VALVE OPEN	DI	IN USE	HARDWIRE	OPEN	CLOSED	X				PCP-1					
MOV-061	ZC-061	VALVE CLOSED	DI	IN USE	HARDWIRE	CLOSED	OPEN	X				PCP-1					
MOV-061	RO-061	CLOSE VALVE	DO	IN USE	HARDWIRE	OPEN	N/A					PCP-1					
MOV-061	RC-061	OPEN VALVE	DO	IN USE	HARDWIRE	CLOSED	N/A					PCP-1					
P-030	TAH-030	TEMPERATURE HIGH	DI	IN USE	HARDWIRE	NORMAL	HIGH TEMP	X				MS-030					
P-510	HS-510	PUMP REMOTE STOP	DI	IN USE	HARDWIRE	NORMAL	REMOTE STOP	X				VFD-510					
P-520	HS-520	PUMP REMOTE STOP	DI	IN USE	HARDWIRE	NORMAL	REMOTE STOP	X				VFD-520					
P-530	HS-530	PUMP REMOTE STOP	DI	IN USE	HARDWIRE	NORMAL	REMOTE STOP	X				VFD-530					
P-540	HS-540	PUMP REMOTE STOP	DI	IN USE	HARDWIRE	NORMAL	REMOTE STOP	X				VFD-540					
P-010	HS-010	PUMP REMOTE STOP	DI	IN USE	HARDWIRE	NORMAL	REMOTE STOP	X				MS-010					
P-020	HS-020	PUMP REMOTE STOP	DI	IN USE	HARDWIRE	NORMAL	REMOTE STOP	X				MS-020					
P-030	HS-030	PUMP REMOTE STOP	DI	IN USE	HARDWIRE	NORMAL	REMOTE STOP	X				MS-030					
P-301	TAH-301	TEMPERATURE HIGH	DI	IN USE	HARDWIRE	NORMAL	HIGH TEMP	X				PCP-1					
P-302	TAH-302	TEMPERATURE HIGH	DI	IN USE	HARDWIRE	NORMAL	HIGH TEMP	X				PCP-1					
P-110	TAH-110	TEMPERATURE HIGH	DI	IN USE	HARDWIRE	NORMAL	HIGH TEMP	X				VFD-110					
P-120	TAH-120	TEMPERATURE HIGH	DI	IN USE	HARDWIRE	NORMAL	HIGH TEMP	X				VFD-120					
P-130	TAH-130	TEMPERATURE HIGH	DI	IN USE	HARDWIRE	NORMAL	HIGH TEMP	X				VFD-130					
P-401	TAH-401	TEMPERATURE HIGH	DI	IN USE	HARDWIRE	NORMAL	HIGH TEMP	X				MS-401					
P-402	TAH-402	TEMPERATURE HIGH	DI	IN USE	HARDWIRE	NORMAL	HIGH TEMP	X				MS-402					
P-510	TAH-510	TEMPERATURE HIGH	DI	IN USE	HARDWIRE	NORMAL	HIGH TEMP	X				VFD-510					
P-520	TAH-520	TEMPERATURE HIGH	DI	IN USE	HARDWIRE	NORMAL	HIGH TEMP	X				VFD-520					
P-530	TAH-530	TEMPERATURE HIGH	DI	IN USE	HARDWIRE	NORMAL	HIGH TEMP	X				VFD-530					
P-540	TAH-540	TEMPERATURE HIGH	DI	IN USE	HARDWIRE	NORMAL	HIGH TEMP	X				VFD-540					
P-010	TAH-010	TEMPERATURE HIGH	DI	IN USE	HARDWIRE	NORMAL	HIGH TEMP	X				MS-010					
P-020	TAH-020	TEMPERATURE HIGH	DI	IN USE	HARDWIRE	NORMAL	HIGH TEMP	X				MS-020					
P-701	TAH-701	TEMPERATURE HIGH	DI	IN USE	HARDWIRE	NORMAL	HIGH TEMP	X				MS-701					
P-702	TAH-702	TEMPERATURE HIGH	DI	IN USE	HARDWIRE	NORMAL	HIGH TEMP	X				MS-702					
PIT-116A	PI-116A	PRESSURE	AI	IN USE	HARDWIRE		N/A			X	X	RO-110					
PIT-116B	PI-116B	PRESSURE	AI	IN USE	HARDWIRE		N/A			X	X	RO-110					
PIT-116C	PI-116C	PRESSURE	AI	IN USE	HARDWIRE		N/A			X	X	RO-110					
PIT-126A	PI-126A	PRESSURE	AI	IN USE	HARDWIRE		N/A			X	X	RO-120					
PIT-126B	PI-126B	PRESSURE	AI	IN USE	HARDWIRE		N/A			X	X	RO-120					
PIT-126C	PI-126C	PRESSURE	AI	IN USE	HARDWIRE		N/A			X	X	RO-120					
PIT-136A	PI-136A	PRESSURE	AI	IN USE	HARDWIRE		N/A			X	X	RO-130					
PIT-136B	PI-136B	PRESSURE	AI	IN USE	HARDWIRE		N/A			X	X	RO-130					
PIT-136C	PI-136C	PRESSURE	AI	IN USE	HARDWIRE		N/A			X	X	RO-130					
PIT-550	PI-550	PRESSURE	AI	IN USE	HARDWIRE		N/A			X	X	PCP-1					
PIT-500	PI-500	PRESSURE	AI	IN USE	HARDWIRE		N/A			X	X	PCP-1					
PSH-115	PAH-115	HIGH PRESSURE	DI	IN USE	HARDWIRE	NORMAL	HIGH PRESSURE	X				RO-110					
PSH-125	PAH-125	HIGH PRESSURE	DI	IN USE	HARDWIRE	NORMAL	HIGH PRESSURE	X				RO-120					
PSH-135	PAH-135	HIGH PRESSURE	DI	IN USE	HARDWIRE	NORMAL	HIGH PRESSURE	X				RO-130					
PSL-114	PAL-114	LOW PRESSURE	DI	IN USE	HARDWIRE	NORMAL	LOW PRESSURE	X				RO-110					
PSL-124	PAL-124	LOW PRESSURE	DI	IN USE	HARDWIRE	NORMAL	LOW PRESSURE	X				RO-120					
PSL-134	PAL-134	LOW PRESSURE	DI	IN USE	HARDWIRE	NORMAL	LOW PRESSURE	X				RO-130					
FS-132A	FS-132A	FLOW	DI	IN USE	HARDWIRE	NORMAL	N/A			X	X	RO-130					

I/O LIST

NO SCALE

NO.	BY	DATE	SYMBOL	REVISIONS
6.				
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MOTT MACDONALD
Mott MacDonald Florida, LLC

Architects Engineers Surveyors
AA - C0000035 EB - 0000155 LB - 0006783
4600 Touchton Rd., Building 200, Suite 250
Jacksonville, Florida 32246
Telephone: (904) 203-1090

DESIGNER:	L.BURNSIDE
DRAWN BY:	W.HILL
DATE:	JUNE 2026
CHECKED BY:	T.PRICE
DATE:	JUNE 2026

DESIGN ENGINEER
ANTONIO GONZALEZ JR., P.E.
FLORIDA REGISTRATION NO.
86300

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

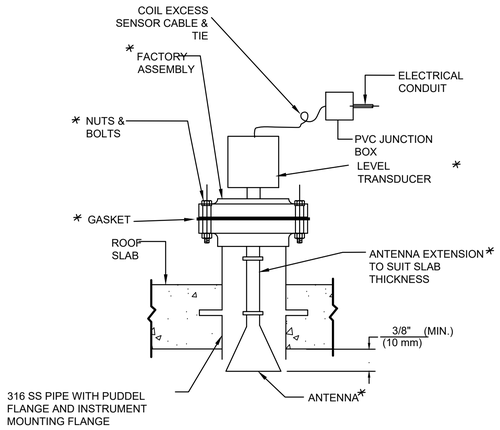
NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

I/O LIST

SHEET NO. 81
DWG NO. I-3.2
100% SUBMITTAL

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X-Schedules [..\Xrefs\X-Schedules.dwg]
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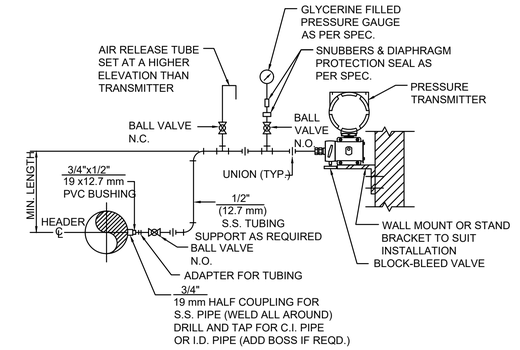


GENERAL NOTES:

1. ARRANGEMENT SHOWN IS AN EXAMPLE ONLY. FINAL ARRANGEMENT OF INSTRUMENTS AND EQUIPMENT SIZES TO BE FINALIZED AT SHOP DRAWING SUBMITTAL STAGE.
2. CONTRACTOR TO PROVIDE SHOP DRAWINGS FOR EACH OF THE PROPOSED ARRANGEMENT FOR REVIEW BY THE ENGINEER. NO FABRICATION SHALL COMMENCE PRIOR TO RECEIPT OF REVIEWED DRAWINGS.
3. ALL INSTRUMENTS TO BE MOUNTED SO THEY CAN BE READILY REMOVED AND SERVICED UTILIZING UNIONS, TUBE CONNECTIONS, ETC.
4. INSTRUMENTS ARE TO BE INDIVIDUALLY LAID OUT TO PROVIDE SUFFICIENT CLEARANCE FOR MAINTENANCE AND HOUSEKEEPING.
5. ALL WALL MOUNTED EQUIPMENT TO HAVE 1/2" (12.7mm) STAINLESS STEEL STANDOFF WASHER OR SPACER.

RADAR LEVEL SENSOR MOUNTING IN CONCRETE

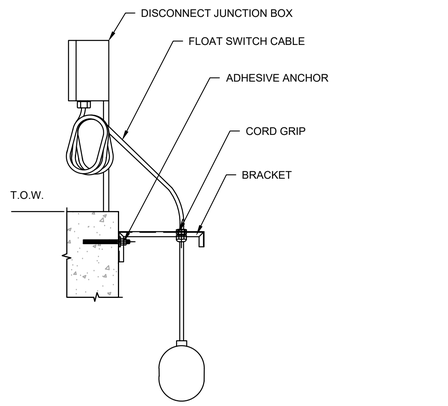
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GENERAL NOTES:

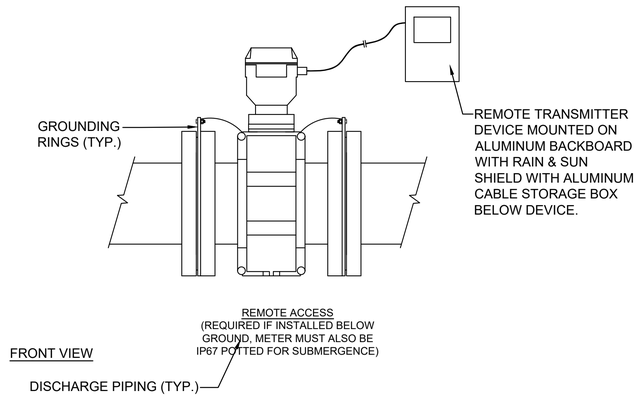
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2. CONTRACTOR TO PROVIDE SHOP DRAWINGS FOR EACH OF THE PROPOSED ARRANGEMENT FOR REVIEW BY THE ENGINEER. NO FABRICATION SHALL COMMENCE PRIOR TO RECEIPT OF REVIEWED DRAWINGS.
3. ALL INSTRUMENTS TO BE MOUNTED SO THEY CAN BE READILY REMOVED AND SERVICED UTILIZING UNIONS, TUBE CONNECTIONS, ETC.
4. INDICATING INSTRUMENTS OR INSTRUMENTS THAT REQUIRE SERVICING, ADJUSTING OR VIEWING SHALL BE MOUNTED BETWEEN ELEVATIONS 48" (1200mm) AND 65" (1650mm) ABOVE FINISHED FLOOR.
5. INSTRUMENTS ARE TO BE INDIVIDUALLY LAID OUT TO PROVIDE SUFFICIENT CLEARANCE FOR MAINTENANCE AND HOUSEKEEPING.
6. ALL WALL MOUNTED EQUIPMENT TO HAVE 1/2" (12.7mm) STAINLESS STEEL STANDOFF WASHER OR SPACER.

PRESSURE TRANSMITTER ARRANGEMENT



FLOAT SWITCH DETAILS

NO SCALE



FLOW METER DETAILS

NO SCALE

NO.	BY	DATE	SYMBOL	REVISIONS
6.				
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AA - C0000035 EB - 0000155 LB - 0006783
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86300

St. Johns County Utility Department
1205 STATE ROAD 16
ST. AUGUSTINE, FL 32084
PHONE: (904) 209-2626 FAX: (904) 209-2627

NORTH BEACH
WATER TREATMENT PLANT
IMPROVEMENTS

INSTRUMENTATION DETAILS 1

SHEET NO. 82
DWG NO. ID-0.1
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Xrefs Attached= SJCUD_22X34_BOR-E [..\Xrefs\SJCUD_22X34_BOR-E.dwg]
SJCUD_22X34_BOR [..\..\C_Civil Engineering\Xrefs\SJCUD_22X34_BOR.dwg]
X-Details [..\Xrefs\X-Details.dwg]
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Ring Power CAT

CAT Power Systems

OLYMPIAN™ GENERATORS

Your North and Central Florida Caterpillar Dealer

ST. AUGUSTINE	TALLAHASSEE	OCALA	ORLANDO	TAMPA
500 World Commerce Prkwy	32000 Blue Star Hwy	6202 N US 301/441	9901 Ringhaver Dr.	9797 Gibsonton Dr
St. Augustine, FL 32092	Midway, FL 32343	Ocala, FL 34475	Orlando, FL 32824	Riverview, FL 33569
904-737-7730	**850-562-1622**	**352-732-4600**	**407-855-6195**	**813-671-3700**

SALES ***SERVICE*** ***PARTS*** ***LEASING*** ***RENTALS***

QUOTATION / SALES AGREEMENT / SECURITY AGREEMENT

DATE: 06/25/2026

QUOTATION NO: BM2026_ 31688324Sourcewell

CUSTOMER NAME: St. Johns County Board of CC
ADDRESS: 2416 Dobbs Rd
CITY/STATE/ZIP: St Augustine, Florida 32086
PHONE: 904-209-2622
CONTACT NAME: Scott Trigg

ESTIMATED SHIPPING LEAD TIME: (See Below)
SHIPPING VIA/FOB: RPC/Jobsite
ESTIMATED SUBMITTAL LEAD TIME: 4 Weeks
JOBSITE ADDRESS: 419 Nineteenth Street
CITY/STATE/ZIP: St Augustine, Florida 32084
PROJECT NAME: SJC North Beach WTP 300 kw Generator

TERMS: *Full payment is due from the buyer within 10 days of delivery or pickup of the equipment.*

DESCRIPTION OF MATERIAL	UNIT PRICE	EXTENSION
One (1) New Caterpillar C9 Diesel Engine Generator Set,300 kw Rated Standby, 277/480 Volt, 3 Phase, Tier 3 Equipped as Follows: • Control Panel • UL2200 Listed Generator • Integrated Voltage Regulator • Permanent Magnet-Excitation • Qty. (1) 600 Amp UL Breaker Adjustable Trip. • Qty. (1) 600 Amp UL Breaker Adjustable Trip. (Used for load Banking) • Shunt Trip & Auxiliary Contact • Anti-Condensation Heater • Low Coolant Alarm Temp 69/80 F • Lead Acid Batteries 24 Volt		

Quotation Accepted By: _____Date: _____Tax No.: _____

Customer: _____Salesman's Signature: *Brian Martinez*

Brian Martinez – EPG Sales NE FL

TERMS

- This offer to sell is made subject to buyer's acceptance within ten (10) days from this date (noted above).
- All quoted prices are subject to change without notice. Those in effect on the date of shipment shall prevail.
- Subject to credit approval.
- Used equipment is subject to prior sale.
- A 25% restocking fee will be assessed for all canceled orders or returned materials.
- No retainage to be withheld. Ring Power Systems is an equipment supplier and is not a sub-contractor. Our terms are Net 10 days.
- No sales tax is included.
- Buyer grants to seller a security interest in all equipment as described in this agreement until such time as payment is made in full in accordance with the terms and conditions of this agreement and in accord with the seller's credit application.
- Ring Power requires a purchase order to secure this sales agreement.

DESCRIPTION OF MATERIAL	UNIT PRICE	EXTENSION
• 10 Amp Dual Rate Battery Charger 110VAC		
• Jacket Water Heater		
• Sound Attenuated Enclosure, Aluminum Factory 150 MPH Wind Rated		
• 125A Load Center		
• Caterpillar 60 Month ESC		
TOTAL NET COST FOR ABOVE		**$180,436.50**
SOURCEWELL Discount – 37% Off List Price.		($66,761.51)
Total List Price with SOURCEWELL Discount		**$113,674.99**
Sourced Good and Support Service SOURCEWELL Discount		
CAT Dealer Additions – All Receive 5% Off List Price per SOURCEWELL		
Automatic Transfer Switch 800 Amp Nema 12 Indoor Enclosure		$29,890.00
Stand Alone Fuel Tank 1,000-gallon 44 hour Convault with Stainless Steel Fittings		$67,576.00
Freight		$4,300.00
Startup and Commissioning (included 1.0PF Load Bank 2 Hour Run Duration.		$9,000.00
Total List Price for Above Sourced Goods and Service Items		$110,766.00
5% Off List CAT Dealer Additions		(5,538.30)
Total Price with SOURCEWELL Discount		$105,227.70
TOTAL NET COST ABOVE		**$218,902.69**

SOURCEWELL – Sourcewell Contract #092222 – CAT

St Johns County Florida SOURCEWELL Customer Account Number 20998

Lead Time Note:

Generator being quoted has a current lead time from the factory of 26-28 Weeks
Fuel Tank has an 18-20 Week lead time from date of order.
Automatic Transfer Switch has a 16–18-week lead time from date or release.

NOTES:

1. **NO DIESEL FUEL IS INCLUDED UNLESS CALLED OUT IN THE QUOTE.**
2. **FREIGHT TO THE JOB SITE IS INCLUDED. NO OFFLOADING UNLESS QUOTED.**
3. **LIMITED SPECIFICATIONS WERE GIVEN FOR THIS QUOTE.**
4. **GENERAL EXCEPTION IS TAKEN TO ANY REQUIREMENT NOT PROVIDED AT THE TIME OF THIS PROPOSAL.**
5. **THE CURRENT PRODUCT LEAD TIME IS NOTED ABOVE IN WEEKS BUT IS SUBJECT TO CHANGE ACCORDING TO FACTORY AVAILABILITY.**
6. **ALL WORK BY RPC TECHNICIANS WILL BE PERFORMED DURING NORMAL WORKING HOURS. MONDAY-FRIDAY 7:30AM TO 4:00PM**
7. **FDEP & EPA NOTICES OF DELIVERY, PERMITTING, AND REGISTRATION ARE NOT INCLUDED. THIS IS THE RESPONSIBILITY OF THE INSTALLING CONTRACTOR AND/OR OWNER.**
8. **ALL START-UP AND TESTING INCLUDED IN THIS PROPOSAL WILL BE PERFORMED BY RING POWER TECHNICIANS. ANY REQUIRED THIRD-PARTY TESTING SHALL BE PROVIDED BY OTHERS.**
9. **Under no circumstances does Ring Power accept any flow down provisions without specific written agreement between Ring Power and Buyer".**
10. **"The Seller shall not be responsible for any failure to perform, or delay in performance of, its obligations resulting from the COVID-19 pandemic or any future epidemic, and Buyer shall not be entitled to any damages resulting thereof."**
11. **"The Seller has provided product lead times based upon the information provided to Seller from its suppliers at the time of quotation. The Buyer accepts that lead times for products can change without notice and due to reasons, that are beyond any control of the Seller. As such, the Seller shall not be responsible for any failure to perform, or delay in performance of, its obligations resulting from lead times that extend past those originally quoted, and Buyer shall not be entitled to any damages resulting thereof.**
12. **CREDIT TERMS TO BE DETERMINED AT THE TIME OF ORDER.**
    a. **95% Due to the time of equipment delivery**
    b. **5% Due at completion of startup and commissioning**
13. **All unforeseen job site items that arise that are not covered in this quote will be charged an additional charge depending on scope.**

Sean Connaway
sean.connaway@us.abb.com
+1 904-325-4940
Quote No.: U33-00020470
Doc Rev. 0.1
Project: SJCUD - North Beach WTP
Quote Version: 6.23.2026 - Bid
Quote Expiration: July 24, 2026

Dear Valued Customer,

Thank you for your inquiry for **SJCUD - North Beach WTP**. We are pleased to respond with our proposal based on the requirements of your inquiry. Please contact us with any questions. We look forward to working with you on this opportunity.

Best Regards,

Sean Connaway
ABB

Estimated Equipment Lead Times (as of 6/24/2026):
Lead times will be updated at order entry and when the equipment is released for manufacturing. The prints for approval and engineer's review time may vary depending on the number of times the factory drawings need to be revised and resubmitted. Lead times are estimates and not a guaranteed schedule. Projects not released to manufacturing within 60 days of receiving prints for approval will be subject to price escalation. The lead times contained in this proposal are for estimating purposes only.

ABB will support an in-person or virtual On-Board submittal review meeting within 2 weeks of submittals being issued. The goal of the meeting is to release equipment "Approved" or "Approved as Noted" for manufacturing by the conclusion of the meeting. ABB requests preliminary submittal review comments be provided 2-days before the meeting.

Equipment	Country of Origin	Prints for Approval	Owner's Review	Manufacturing after Release	Witness Test	Shipping Transit
Motor Control Centers	MX	10-16 weeks	2-4 weeks	38-42 weeks	Not Included	1 week

PROPRIETARY AND CONFIDENTIAL INFORMATION

This document contains confidential and proprietary information. By accepting this document, the recipient agrees not to disclose its contents except to individuals within their organization who are directly involved in evaluating this proposal. No copies may be made without prior written permission. Upon written request, this document must be returned.

Subject	Notes
Warranty	60-month warranty from shipment is included for the motor control centers. This is the maximum warranty period available. 24-month warranty from shipment is included for MCB-1.
Price Validity	Price valid for an order received by July 22, 2026, and project released within 60 days of submittal drawings being provided.
Equipment Lead Times	Lead times are estimates only and not a guaranteed schedule. Lead times will be updated at order entry and when the equipment is released for manufacturing. The estimated ship date provided at release is not a guaranteed ship date. ABB takes exception to any liquidated damages. ABB General Terms and Conditions of Sale and standard lead times apply.
Country of Origin	ABB makes no representation that the quoted product(s) comply with any US federal or state government imposed domestic product preference (e.g., Buy America, Buy American) or other government imposed specific requirements. To the extent that Federal government Build America, Buy America Act or other State government domestic product preference requirements are applicable to this contract, the country of origin of products is unknown unless otherwise specifically stated by Seller. Buyer shall indemnify Seller against all claims by such applicable government entity for non-compliance with any undisclosed requirements. Exception is taken to any BABA requirements. ABB's proposal is not BABA compliant. Country of Origin for ABB products: • LV Motor Control Centers=Mexico
Freight Terms	This proposal includes FCA Factory shipping terms. Unloading equipment is by others.
Factory Testing	No customer witness testing is included. Standard factory test procedures are included.
Field Services	Field Services are included for MCC startup. Field services cannot be recorded / filmed. NETA testing is not included.
Spare Parts	Spare fuses and indicating lights are included for the MCCs. No spare parts are included for MCB-1 (no applicable spare parts).
Scope Clarification	Items included in this proposal: 1. MCB-1 2. MCC-1 3. MCC-2 4. Field Services for MCC startup. Items not included in this proposal: 1. Disconnects 2. Variable Frequency Drives 3. Utility Meter Can/CT Cabinet 4. Genset Equipment 5. Generator Panel GLC-1 6. Automatic Transfer Switch 7. NETA Testing 8. Infrared Scanning 9. Installation 10. Power System Study

Product Notes

Motor Control Centers

1. Ethernet/IP communication protocol is included for the Softstarters and FVNR starters in the motor control centers per the project specifications. Typically, Saint Johns County Utility Department uses Modbus TCP/IP communication protocol. Please advise if the required communication protocol is Ethernet/IP or Modbus TCP/IP.

2. IP Addresses cannot be factory programmed. They will be programmed in the field by ABB Field Services.

3. Panel LP-1 (integral to MCC-1) is proposed as a 42-circuit panel in lieu of the 54-circuit panel shown on drawing sheet E-3.1. 42 circuits are the maximum number available for a panel integral to a motor control center.

4. Integral transformer is proposed with 150 degree C temperature rise. A temperature rise of 115 degree C is not available for an integral transformer.

5. Main breakers are draw-out mounted and manually operated. No integral spring charging motors are included.

6. Due to draw-out mounting of the main breakers, the main breaker sections are deeper than the feeder breaker sections. The main and feeder breaker sections are rear aligned but not front aligned.

7. Terminal boards are front-mounted.

8. Wall-mounted SPDs external of the MCCs may be provided if needed for room layout purposes (fitting equipment in electrical room).

9. No control schematics provided for the FVNR starters. A control schematic will need to be provided prior to starting the submittal process.

MCB-1

1. MCB-1 is fixed mounted and not draw-out construction.

2. The SPD for MCB-1 is external of the enclosed circuit breaker enclosure.

Bill of Material(s)

Item No.	Quantity	Description
1	1	**MCCB, ECB TMAX XT, XB7HQ380CGWWDAH5XX** **Marks: MCB-1** 1 XT7HQ380CGFF000XXX XT7H 800 E.DIP LSIG 800 3P FF UL100(1SDX103757R1) 1 Installed KXT7CUAL4X500K-3PC KIT FCCUAL4X500KCMIL XT7/M F 3PCS(1SDA104758R1) 1 Installed KXT7CUAL4X500K-3PC KIT FCCUAL4X500KCMIL XT7/M F 3PCS(1SDA104758R1) 1 Installed ZEASE YO E1.2..E6.2 110-120 VAC/DC(1SDA073672R1) 1 Installed ZE1AUX4 AUX 4Q 400V E1.2(1SDA073750R1) 1 SBX7W50P3 NEXT SERVICE BARRIER XT7 500MCM(1SQA000945R0001) 1 XT7ENCL1200J ENCLOSURE TMAX XT7 NEMA 12 NO KO(1SQA008332R0001) 1 TNIA1200XTGF ASM 1200A SPLIT NEUTRAL WITH GND STRAP(1SQA001289R0001) 1 ZE1NCT EXT CS N E1.2 E2.2 UL ONLY(1SDA082134R1) Factory to supply neutral and Neutral Sensor for GF w/ Enclosure. Factory to supply neutral w/ Enclosure. 1 TGL6 EQUIPMENT GROUND KIT(TGL6) Breaker will be mounted in enclosure in factory. Global ID-(1SQA732492R0001)
2	1	**Surge Protection Device, Wall Mount – External of MCB-1** **Marks: MCB-1 SPD** 1 UL SPD Type : Type 1 Surge Current Rating : 300 kA per phase Voltage : 277Y/480 Fault Withstand : 200 kAIC Enclosure : Nema 4 W Disconnect Integral Disconnect : Yes Pre-Wired/Pigtail Leads : No **Features :** Display Dry Contacts Audible Alarm
3	1	**Motor Control Center, Low Voltage** **Marks: MCC-1** **7 Section(s), NEMA TYPE 12** Not Suitable for Service Entrance 800 Amps, 3 Phase 4 Wire, 480 V ac, 60 Hz Minimum Interrupt Rating: 65kA Fully Rated; Bus Bracing Rating: 65 kA Incoming Feed: Bottom Incoming Right Feeding Left Front Only Mounting NEMA Wiring Classification I-BT "Class 1-BT (Independent units with NO Factory interconnecting wires, load wiring to Terminal Board (Size 1&2))" UL 845 Certified for US and Canada, NEMA ICS 18, NEC The Lineup will NOT be provided with Seismic Certification Enclosure Paint: ANSI-61 (Light Gray) tested to minimum withstand of 600 hours humidity and salt spray test. Customer will provide Specifications and Drawings to the Factory. **Dimensions and Weight (Estimated)**

Bill of Material(s)

Section 1 "AA":
Height=90 in; Width=30 in; Depth=22 in
Section 2 "AB":
Height=90 in; Width=20 in; Depth=22 in
Section 3 "AC":
Height=90 in; Width=20 in; Depth=22 in
Section 4 "AD":
Height=90 in; Width=20 in; Depth=22 in
Section 5 "AE":
Height=90 in; Width=24 in; Depth=30 in
Section 5 "Filler":
Height=90 in; Width=5 in; Depth= 20 in
Section 6 "AF":
Height=90 in; Width=20 in; Depth=22 in
Section 7 "AG":
Height=90 in; Width=24 in; Depth=30 in
Lineup Total:
Height=90 in; Width=163 in; Depth=30 in

List of Materials

1	NEMA TYPE 12 Enclosure 30W
4	NEMA TYPE 12 Enclosure 20W
2	NEMA TYPE 12 Enclosure 24W
1	NEMA TYPE 12 Transition Section Filler 5W
1	Fully Rated COPPER Standard Tin plated Bus 1600A 30 Wide
4	Fully Rated COPPER Standard Tin plated Bus 1600A 20 Wide
2	Fully Rated COPPER Standard Tin plated Bus 1600A 24 Wide
1	Ground COPPER Standard Tin plated Bus 300A 30 Wide
4	Ground COPPER Standard Tin plated Bus 300A 20 Wide
2	Ground COPPER Standard Tin plated Bus 300A 24 Wide
1	Neutral COPPER Standard Tin plated Bus 800A 30 Wide
4	Neutral COPPER Standard Tin plated Bus 800A 20 Wide
2	Neutral COPPER Standard Tin plated Bus 800A 24 Wide
1	Vertical Ground Bus Provided 42 High
4	Vertical Ground Bus Provided 72 High
17	Vertical Unit Grounding Stab provided
1	Vertical COPPER Standard Tin plated Bus 600A 42 High
4	Vertical COPPER Standard Tin plated Bus 600A 72 High

Options

1	Steel Bottom Plates
4	Steel Bottom Plates
2	Steel Bottom Plates
7	Insulated Main Bus
5	Low Voltage Barrier
14	Unit Shutter Mechanism
1	Certified Test Reports
7	Double-Bolted Main Bus
1	Space Heater (120V)
4	Space Heater (120V)
2	Space Heater (120V)
1	Thermostat (120V)
1	Standard Catalog Renewal Parts Book
1	Blank Master Nameplate Black with White Text
25	Engraved Nameplates Black with White Text
25	Screw On Nameplates
25	Internal Device Identification Labels
7	NEMA Wiring Classification: I-BT "Class 1-BT (Independent units with NO Factory interconnecting wires, load wiring to Terminal Board (Size 1&2))"
3	Control Wire Type: MTW VW1 (Standard)
3	Control Wire Markers: Heat Shrink Non PVC
3	Control Wire Terminal: Non Insulated Ring
3	Control Terminal Board: Hi Density Standard
14	Power Wire Type: MTW VW1 (Standard)
14	Power Wire Markers: Heat Shrink Non PVC
14	Power Wire Terminal: Stripped Wire (Standard)

Bill of Material(s)

14	Power Wire Terminal Board: Standard
	Main Circuit Breaker
1	Circuit Breaker, 1600 A Frame, 800 A Trip, 3 Pole, Thermal Magnetic E2.2S16
	Manually Operated Circuit Breaker
	Drawout Mounted w/ Cradle
	Ekip Touch Trip Unit LSIG
32	#2 AWG - 600 MCM Mechanical (2-Hole) ALUMINUM Line Lugs (8) Cables Per Phase and Neutral
1	RELT - Reduced Energy Let Through
1	4 Auxiliary Contacts 400V
1	Bell Alarm - Std 250V
1	Ekip Supply - 24-48 VDC
	Metering / Monitoring
	Lineup Component Communication EtherNet/IP
1	EtherNet/IP Power Supply
1	EtherNet/IP Cable / Accessories
1	Communication Ethernet Switch
1	Type 2 Surge Protection Device HE 125/250 kA per Mode/Phase
1	RGM 7000 (Shark200-60-10-V2-D2-INP100S-X-X) Main
3	Potential Transformer (3)
	SoftStarter
2	SoftStarters
	15 hp; 14.92 kW
	INTEGRATED BYPASS Feature
2	Circuit Breaker, 40 A Trip, 3 Pole, Thermal Magnetic, XT4H250
	Stationary Stab
	Thermal Magnetic Fixed Trip Unit
2	Shunt Trip - 110-127 V ac / 110-125 V dc
2	Auxilary Switch - 1Q + 1SY 250 V ac
2	Required Circuit Relays
2	Elapsed Time Meter
2	EtherNet/IP Fieldbus Adapter
2	Control Power Type: Control Power Transformer - 150VA
	Blank Pilot Device Bracket Not Provided
	Custom Relays
6	Control Relay: NF Series 120V Auxiliary Control with 2NO 2NC
2	Time Delay Relay: TEF4 -NF Series 120V Timing 0.1 - 100 Seconds On-Delay with 2NO 2NC TD
	Starter Manual Entry
2	CR104PBG GE Push Button - Single Function
6	CR104PLT92 GE Indicating Light - LED PTT
2	CR104PSG34B GE Selector Switch - 3 Position
2	FLY#MINICASTII FLYGT Control - Pump MiniCastII
2	CPT300VA-120/24 GE CPT - 300VA 120V/24V
2	FB250V GE Fuse Block - 250V w/Fuse
	Starter
1	Full Voltage Non-Reversing, 300 Contactor Type
	3 hp; 2.24 kW, Nema Size 1, Magnetic Starter
1	Circuit Breaker, 10 A Trip, 3 Pole, Magnetic, XT2H125
	Stationary Stab
	Ekip Dip I Trip Unit
1	Auxilary Switch - 1Q + 1SY 250 V ac
1	UMC100 110 - 240 V AC/DC Operational Panel Provided
1	EIU-EtherNet/IP™ Interface
1	VI155-3-Phase Voltage Module For All Networks
1	DX122-I/O-Expansion Module With Eight Digital Inputs 110/230 V Ac
1	Starter Surge Suppressor
1	Elapsed Time Meter
1	Control Power Type: Control Power Transformer - 300VA
1	Aux Contacts
	Used Contacts: (1) Normally Open Contact (1) Normally Closed Contact
1	Pilot Devices
	Lights : Run / Stop (Red / Green), Push To Test, LED Transformer
	Lights : Fault Trip (Amber), Push To Test, LED Transformer

Bill of Material(s)

	Switches / Pushbuttons : Hand / Off / Auto (SW) and Stop / Start (PB) (Black / (Red / Black)), Non Illuminated
	Custom Relays
2	Control Relay: NF Series 120V Auxiliary Control with 4NO 4NC
	Feeder
4	Circuit Breaker, 125 A Frame, 30 A Trip, 3 Pole, Thermal Magnetic, XT2H125 Manually Operated Circuit Breaker Stationary Stab
12	#14 - 1/0 AWG Mechanical Aluminum Load Lugs Thermal Magnetic Fixed Trip Unit
	Feeder
2	Circuit Breaker, 125 A Frame, 100 A Trip, 3 Pole, Thermal Magnetic, XT2H125 Manually Operated Circuit Breaker Stationary Stab
6	#14 - 1/0 AWG Mechanical Aluminum Load Lugs Electronic Ekip Dip LSI Trip Unit
	Feeder
2	Circuit Breaker, 125 A Frame, 60 A Trip, 3 Pole, Thermal Magnetic, XT2H125 Manually Operated Circuit Breaker Stationary Stab
6	#14 - 1/0 AWG Mechanical Aluminum Load Lugs Electronic Ekip Dip LSI Trip Unit
	Feeder
1	Circuit Breaker, 125 A Frame, 20 A Trip, 3 Pole, Thermal Magnetic, XT2H125 Manually Operated Circuit Breaker Stationary Stab
3	#14 - 1/0 AWG Mechanical Aluminum Load Lugs Thermal Magnetic Fixed Trip Unit
	Feeder
1	Circuit Breaker, 125 A Frame, 35 A Trip, 3 Pole, Thermal Magnetic, XT2H125 Manually Operated Circuit Breaker Stationary Stab
3	#14 - 1/0 AWG Mechanical Aluminum Load Lugs Thermal Magnetic Fixed Trip Unit
	Feeder
1	Circuit Breaker, 1200 A Frame, 1200 A Trip, 3 Pole, Thermal Magnetic, E2.2S12 Manually Operated Circuit Breaker Drawout Mounted w/ Cradle Ekip Touch Trip Unit LSIG Stationary Stab
1	RELT - Reduced Energy Let Through
1	RELT - Power Supply
1	4 Auxiliary Contacts 400V
1	Bell Alarm - Std 250V
1	Ekip Supply - 24-48 VDC
	Distribution Transformer
1	37.5 kVA Transformer, 1 Phase, 240/120 Secondary Voltage, Primary Taps Provided, COPPER Winding
1	Circuit Breaker, 250 A Frame, 125 A Trip, 3 Pole, Thermal Magnetic, XT4H250 Stationary Stab Electronic Ekip Dip LSI Trip Unit
	Lighting Panelboards
1	42 Circuits RQ-ReliaGear THQB Branches, 240V, 800A Max 225 Amps, 1 Phase 3 Wire 120/240V Minimum Interrupt Rating: 22kA Fully Rated Incoming Main Feed: Bottom from Distribution Transformer in Lineup 200 Amps, Main Circuit Breaker Al - 1-lug/phase 1-cable/lug 2/0 -300 MCM or Or Cu - 1-lug/phase 1-cable/lug #1 - 250 MCM Tin Plated Copper Bus 1000A PSI (4) Feeder Breaker Device 20 Amps 2 Poles THHQB (2) Feeder Breaker Device 30 Amps 2 Poles THHQB (1) Feeder Breaker Device 60 Amps 2 Poles THHQB (28) Feeder Breaker Device 20 Amps 1 Poles THHQB

Bill of Material(s)

Lighting Panelboard Manual Entry
1 TV65 GE TVSS, panelboard, 65kA, style ME
Space Unit
3 Customer Available Spaces Height=12 in
2 Customer Available Spaces Height=6 in

4 1 Motor Control Center, Low Voltage
Marks: MCC-2

5 Section(s), NEMA 1 with Gasketing
Not Suitable for Service Entrance
800 Amps, 3 Phase 4 Wire, 480 V ac, 60 Hz
Minimum Interrupt Rating: 65kA Fully Rated; Bus Bracing Rating: 65 kA
Incoming Feed: Bottom
Incoming Right Feeding Left
Front Only Mounting
NEMA Wiring Classification I-BT "Class 1-BT (Independent units with NO Factory interconnecting wires, load wiring to Terminal Board (Size 1&2))"
UL 845 Certified for US and Canada, NEMA ICS 18, NEC
The Lineup will NOT be provided with Seismic Certification
Enclosure Paint: ANSI-61 (Light Gray) tested to minimum withstand of 600 hours humidity and salt spray test.
Customer will provide Specifications and Drawings to the Factory.
Dimensions and Weight (Estimated)
Section 1 "AA":
Height=90 in; Width=20 in; Depth=20 in
Section 2 "AB":
Height=90 in; Width=20 in; Depth=20 in
Section 3 "AC":
Height=90 in; Width=20 in; Depth=20 in
Section 4 "AD":
Height=90 in; Width=20 in; Depth=20 in
Section 5 "AE":
Height=90 in; Width=24 in; Depth=30 in
Lineup Total:
Height=90 in; Width=104 in; Depth=30 in
List of Materials
1 NEMA 1 With Gasketing Enclosure 20W
3 NEMA 1 With Gasketing Enclosure 20W
1 NEMA 1 With Gasketing Enclosure 24W
4 Fully Rated COPPER Standard Tin plated Bus 1200A 20 Wide
1 Fully Rated COPPER Standard Tin plated Bus 1200A 24 Wide
4 Ground COPPER Standard Tin plated Bus 300A 20 Wide
1 Ground COPPER Standard Tin plated Bus 300A 24 Wide
4 Neutral COPPER Standard Tin plated Bus 1200A 20 Wide
1 Neutral COPPER Standard Tin plated Bus 1200A 24 Wide
1 Vertical Ground Bus Provided 48 High
3 Vertical Ground Bus Provided 72 High
11 Vertical Unit Grounding Stab provided
1 Vertical COPPER Standard Tin plated Bus 600A 48 High
3 Vertical COPPER Standard Tin plated Bus 600A 72 High
Options
5 Insulated Main Bus
4 Low Voltage Barrier
8 Unit Shutter Mechanism
1 Certified Test Reports
5 Double-Bolted Main Bus
4 Space Heater (120V)
1 Space Heater (120V)
1 Thermostat (120V)
5 Equipment Mounted Elementary Wiring Diagram
1 Standard Catalog Renewal Parts Book
1 Blank Master Nameplate White with Black Text
20 Engraved Nameplates White with Black Text

Bill of Material(s)

20	Screw On Nameplates
20	Internal Device Identification Labels
5	NEMA Wiring Classification: I-BT "Class 1-BT (Independent units with NO Factory interconnecting wires, load wiring to Terminal Board (Size 1&2))"
3	Control Wire Type: SIS VW1
3	Control Wire Markers: Heat Shrink Non PVC
3	Control Wire Terminal: Insulated Locking Spade
3	Control Terminal Board: Hi Density Standard
8	Power Wire Type: SIS VW1 OR XHHW
8	Power Wire Markers: Heat Shrink Non PVC
8	Power Wire Terminal: Stripped Wire (Standard)
8	Power Wire Terminal Board: Standard
3	Additional 6 Point Terminal Board
	Main Circuit Breaker
1	Circuit Breaker, 1200 A Frame, 800 A Trip, 3 Pole, Thermal Magnetic E2.2S12
	Manually Operated Circuit Breaker
	Drawout Mounted w/ Cradle
	Ekip Touch Trip Unit LSIG
	#2 AWG - 600 MCM Mechanical (2-Hole) ALUMINUM Line Lugs (8) Cables Per Phase and Neutral
1	RELT - Reduced Energy Let Through
1	4 Auxiliary Contacts 400V
1	Bell Alarm - Std 250V
1	Keylock Provided
1	Ekip Supply - 24-48 VDC
	Metering / Monitoring
	Lineup Component Communication EtherNet/IP
1	EtherNet/IP Power Supply
1	EtherNet/IP Cable / Accessories
1	Communication Ethernet Switch
1	Type 2 Surge Protection Device HE 125/250 kA per Mode/Phase
1	RGM 7000 (Shark200-60-10-V2-D2-INP100S-X-X) Main
3	Potential Transformer (3)
	SoftStarter
1	SoftStarters
	15 hp; 14.92 kW
	INTEGRATED BYPASS Feature
1	Circuit Breaker, 40 A Trip, 3 Pole, Thermal Magnetic, XT4H250
	Stationary Stab
	Thermal Magnetic Fixed Trip Unit
1	Shunt Trip - 110-127 V ac / 110-125 V dc
1	Auxilary Switch - 1Q + 1SY 250 V ac
1	Required Circuit Relays
1	Elapsed Time Meter
1	EtherNet/IP Fieldbus Adapter
1	Control Power Type: Control Power Transformer - 150VA
	Blank Pilot Device Bracket Not Provided
	Custom Relays
3	Control Relay: NF Series 120V Auxiliary Control with 2NO 2NC
1	Time Delay Relay: TEF4 -NF Series 120V Timing 0.1 - 100 Seconds On-Delay with 2NO 2NC TD
	Starter Manual Entry
1	CR104PBG GE Push Button - Single Function
3	CR104PLT92 GE Indicating Light - LED PTT
1	CR104PSG34B GE Selector Switch - 3 Position
1	FLY#MINICASTII FLYGT Control - Pump MiniCastII
1	CPT300VA-120/24 GE CPT - 300VA 120V/24V
1	FB250V GE Fuse Block - 250V w/Fuse
	Starter
1	Full Voltage Non-Reversing, 300 Contactor Type
	3 hp; 2.24 kW, Nema Size 1, Magnetic Starter
1	Circuit Breaker, 10 A Trip, 3 Pole, Magnetic, XT2H125
	Stationary Stab
	Ekip Dip I Trip Unit

Bill of Material(s)

1	Auxilary Switch - 1Q + 1SY 250 V ac
1	UMC100 110 - 240 V AC/DC Operational Panel Provided
1	EIU-EtherNet/IP™ Interface
1	VI155-3-Phase Voltage Module For All Networks
1	DX122-I/O-Expansion Module With Eight Digital Inputs 110/230 V Ac
1	Starter Surge Suppressor
1	Elapsed Time Meter
1	Control Power Type: Control Power Transformer - 300VA
1	Aux Contacts
	Used Contacts: (1) Normally Open Contact (1) Normally Closed Contact
1	Pilot Devices
	Lights : Run / Stop (Red / Green), Push To Test, LED Transformer
	Lights : Fault Trip (Amber), Push To Test, LED Transformer
	Switches / Pushbuttons : Hand / Off / Auto (SW) and Stop / Start (PB) (Black / (Red / Black)), Non Illuminated
	Custom Relays
2	Control Relay: NF Series 120V Auxiliary Control with 4NO 4NC
	Starter
1	Full Voltage Non-Reversing, 300 Contactor Type
	1 hp; 0.75 kW, Nema Size 1, Magnetic Starter
1	Circuit Breaker, 10 A Trip, 3 Pole, Magnetic, XT2H125
	Stationary Stab
	Ekip Dip I Trip Unit
1	Auxilary Switch - 1Q + 1SY 250 V ac
1	UMC100 110 - 240 V AC/DC Operational Panel Provided
1	EIU-EtherNet/IP™ Interface
1	VI155-3-Phase Voltage Module For All Networks
1	DX122-I/O-Expansion Module With Eight Digital Inputs 110/230 V Ac
1	Starter Surge Suppressor
1	Elapsed Time Meter
1	Control Power Type: Control Power Transformer - 300VA
1	Aux Contacts
	Used Contacts: (1) Normally Open Contact (1) Normally Closed Contact
1	Pilot Devices
	Lights : Run / Stop (Red / Green), Push To Test, LED Transformer
	Lights : Fault Trip (Amber), Push To Test, LED Transformer
	Switches / Pushbuttons : Hand / Off / Auto (SW) and Stop / Start (PB) (Black / (Red / Black)), Non Illuminated
	Custom Relays
2	Control Relay: NF Series 120V Auxiliary Control with 4NO 4NC
	Feeder
2	Circuit Breaker, 125 A Frame, 30 A Trip, 3 Pole, Thermal Magnetic, XT2H125
	Manually Operated Circuit Breaker
	Stationary Stab
3	#14 - 1/0 AWG Mechanical Aluminum Load Lugs
	Thermal Magnetic Fixed Trip Unit
	Feeder
1	Circuit Breaker, 125 A Frame, 100 A Trip, 3 Pole, Thermal Magnetic, XT2H125
	Manually Operated Circuit Breaker
	Stationary Stab
3	#14 - 1/0 AWG Mechanical Aluminum Load Lugs
	Electronic Ekip Dip LSI Trip Unit
	Feeder
3	Circuit Breaker, 125 A Frame, 60 A Trip, 3 Pole, Thermal Magnetic, XT2H125
	Manually Operated Circuit Breaker
	Stationary Stab
9	#14 - 1/0 AWG Mechanical Aluminum Load Lugs
	Electronic Ekip Dip LSI Trip Unit
	1200A Feed Thru Lugs
1	Feed Thru Lugs Assembly
12	#2 AWG - 600 MCM Mechanical (1-Hole) ALUMINUM Line Lugs (3) Cables Per Phase and Neutral
	Space Unit
7	Customer Available Spaces Height=12 in

Bill of Material(s)

5 **1** **Spare Parts**
Marks: MCC SPARE PARTS

6 **1** **Services, Start-up and Commissioning**
Marks: MCC START-UP

Industry: Water and Wastewater
Service Site Location: Florida
Contract Type: Firm Fixed
Government Funded Project: Yes
Specification Available: Yes
One Line Drawing Available: Yes
SFDC: 814212
Total Mobilizations: 1
Man-Days: Qty (4) Man-Days of Field Services for MCC pre-energization checkout, Monday-Friday (12:00pm Monday – 12:00pm Friday), Non-Holiday.

ADDENDUM #01

August 3, 2026

To: **Prospective Bidders**
From: **St. Johns County Purchasing Department**
Subject: **IFB No: 2995; North Beach Water Treatment Plant Improvements**

This Addendum #01 is issued for further Bidders' information and is hereby incorporated into the Bid Documents. Each Bidder must incorporate any and all revisions, clarifications, and/or supplemental information provided in all issued addenda with the submitted Bid. Bidders must complete and submit Attachment "O," acknowledging all issued addenda with their Bid as provided in the IFB Documents.

Revisions/Clarifications:
The County provides the following revisions and/or clarifications to be incorporated into the Bid Documents:

1. Part 1 – General Terms and Conditions, Section 29 Contract Time – Liquidated Damages, Paragraph 3 is hereby revised to state the following:

   The work to be performed under this Agreement shall be commenced within ten (10) days of the date of the Notice to Proceed, in writing. Construction of the project shall be Substantially Complete within **Four Hundred Twenty (420)** consecutive calendar days from the date stipulated on the Notice to Proceed. Final Completion shall be attained **Thirty (30)** consecutive calendar days from the date of substantial completion."

2. Reverse Osmosis Skids manufactured by Fluence Corporation Limited is an acceptable manufacturer and acceptable equal to the specified products for this project.

3. Make the following revisions to Exhibit A – Project Manual North Beach Water Treatment Plant – June 2026, Section 16900:
   - Delete 1.05.C.8 and 1.05.C.9
   - Delete 1.05.E and 1.05.F.
   - Delete 1.08.B.2.g.
   - Delete 'Program' from 1.08.C.
   - Replace 'Booster Pump Station' with 'WTP' in 1.08.C
   - Delete 1.08.D.10
   - Revise 3.02.B to state: McKim & Creed will be performing all programming work related to the control system PLCs, OITs, and communication back to the County SCADA system along with the County HMI graphics modifications related to the new water plant. McKim & Creed will work directly with the County to perform these services under a separate contract.
   - Delete 3.02.C

4. Replace the Official County Bid Form with the Revised Official County Bid Form contained in this Addendum.

Questions/Answers:
The County provides the following answers to the questions submitted below:

1. Can the owner provide an allowance for the FPL involvement of the new transformer, service, and metering coordination?
   Answer: An allowance has been added to the bid form in the amount of $10,000 lump sum. See Revisions/Clarifications #4.

2. Can the owner provide an allowance for the AT&T involvement of the new underground service?
   Answer: An allowance has been added to the bid form in the amount of $20,000 lump sum. See Revisions/Clarifications #4.

3. McKim & Creed is listed as the required integrator for the programming on spec sheet 01010-2, #10. Will the McKim & Creed contract be between McKim & Creed and the owner or McKim & Creed and the contractor?
   Answer: County will procure the programming for the Facility.

4. Appendix B - Permits does not appear to be included with the contract documents. Please provide a list of permits required by the contractor.
   Answer: The Contractor shall be responsible for obtaining all required permits, approvals, and clearances necessary to perform the work, including, but not limited to, electrical permits, building permits, DRC clearance sheets, and any other applicable local or state permits.

5. ITB Page 10 states the contract time is 90 days to substantial, 120 days to final. Please clarify if this is the intended contract time.
   Answer: See Revisions/Clarifications #1.

6. Is there an engineer's estimate or budget?
   Answer: The Engineer's estimate was approximately $4.5M, this does not include the bid alternative work.

7. Can the owner provide plant flow data for the bypassing connection requirements?
   Answer: The plant flow data varies depending on the pipe being bypassed. Average ADF to date is approximately 500,000 gpd and MDF is approximately 660,000 gpd.

8. Please confirm that both the generator and MCC scopes provided are to be furnished by the owner and installed by the contractor?
   Answer: Yes, furnished by County.

9. In reference to the previous question, the MCC quote appears to be expiring on July 24th, 2026. If the contractor is to procure the material, a new quote will need to be supplied that lasts through the procurement period.
   Answer: Furnished by County.

10. Are there any domestic requirements for this project such as AIS or BABAA requirements?
    Answer: The American Iron and Steel Act (AIS) or Build America Buy America Act do not apply to this project.

11. Are Davis Bacon wages applicable to this project?
    Answer: The Davis-Bacon Act does not apply to this project.

12. Is the tree mitigation fund on sheet C-1 a cost to be borne by the contractor or the owner?
Answer: Funded by the County.

13. Is the tree mitigation fund on sheet C-1 a cost to be borne by the contractor or the owner?
Answer: Funded by the County.

14. Spec Section 16075 designates an identification for a security system. No security system is stated on the specifications or plans. Please clarify.
Answer: Section 16075 has typical identification language, no security system is onsite therefore no security identification is required at this time.

15. Spec section 11200 states Xylem is the provider of the Horizontal Centrifugal Pumps for Potable Water. Please confirm they are the sole sourced provider for this item or if any other pump manufacturers could be pre-approved before the bid.
Answer: Xylem was listed to match that of the existing HSP, engineer approved equals are acceptable based on the SJCUD Approved Materials, latest edition, https://www.sjcfl.us/utility-development-group/.

16. Section 11200 states the GST Feed Pumps for the bid alternate are to be Horizontal Centrifugal Pumps by Xylem. Spec section 11214 states that the GST Feed Pumps are Vertical Turbine Can Pumps provided by Goulds. Please clarify.
Answer: Section 11200 to be revised in the conformed set, GST feed pumps are to be vertical turbine can pumps.

17. Is the tank drain pump out on drawing c-5 intended to be constructed with GST 2 (by others) or is it part of this contract?
Answer: The tank drain for GST No. 1 is to be installed by the contractor.

18. Are the abandoned existing HSP lines on Sheet C-2 required to be grout filled or removed?
Answer: To be removed where possible and capped in place afterwards.

19. Are you able to submit a question asking for confirmation that there are no AIS or BABA domestic requirements?
Answer: See answer to Question # 10.

20. The only domestic requirement we see is regarding the bolts in the DIP spec section 15072. Just seems odd for a SJCUD project to have this bolt requirement.
Answer: 15072 indicates that above ground piping shall be bolted with 316 stainless steel.

21. Please confirm building code. (FBC 2023 or FBC 2023 HVHZ)?
Answer: FBC 2023, latest edition.

22. 13125-11, 2.04, Roof insulation to be R-19 laminated single layer system in the roof and R-15 in the walls. Sheet A-6 calls for 1.5" of light weight concrete over 1.5" metal roof deck., 13125-15,2.07 calls for a standing seam roof. We cannot install a standing seam roof over the top of light weight concrete. Sheet A-4, detail 3 does not detail any metal deck or LWC and appears to detail blanket insulation in the roof and walls. Should I assume the metal deck and LWC is a miss print?
Answer: A-6 shall delete reference in Section 1, '1 ½" LW CONC. TOPPNG OVER 1 ½" INSULATION ON 1 ½" METAL DECK AT ROOF EDGE' in its entirety. R values stated in 13125 are correct.

23. On page S-7 the Canopy is called out as an Aluminum or Pre-Engineered Metal Building Canopy then in the 2nd detail says it should be hot dipped galvanized steel. We strictly deal with aluminum and are requesting a product approval to bid this canopy out of aluminum. Just asking for clarification on the detail.
Answer: The Contractor has the option of either bidding with a pre-engineered aluminum canopy (6061-T6) OR a pre-engineering metal building canopy that is hot dipped galvanized steel (to include gutters and downspouts).

24. Could you please provide the list of engineer-approved equal manufacturers for the VFDs specified for the St. Augustine North Beach Water Treatment Plant Improvements project**?**
Answer: Base Bid electrical equipment was per-purchased by the County and is ABB. For the Vertical Can Pumps, The VFD spec calls for ABB or engineered approved equal, which they should submit on for acceptance. Our standard approved manufacturer's are listed below. ABB, Eaton Corp., Schneider Electric. McKim & Creed is listed as the required integrator and will be contracted through the County for services.

25. Can you approve Grundfos Paco as named approved equal for this project for Section 11200 Horizontal Centrifugal Pumps for potable water?
Answer: Goulds close coupled end suction pumps are listed as to match existing pumps on site and one that is to relocated that was recently purchased. Other manufacturers will need to submit in accordance with Section 7. Substations of the Bid document. The bid alternate GST transfer pumps are vertical turbine pumps and or equal submittals will be considered will appropriate documentation.

26. Can you provide clarification if end suction or split case pumps are acceptable for the pump applications on Section 11200 Horizontal Centrifugal pumps for Potable water? Section 11200, 1.03, A, B, C and 2.02, A., 1., specifies split case pumps for the High Service, RO Feed and GST Feed pumps. However, Tables 11200-1, 2, 3 (HSPs) list Xylem models 10BF1Q9T3-T, 12BF2M9B0, 8BF3M9H0. These are all close coupled end suction pumps. See the following link for details. Goulds 12BF2M9B0 3656 M&L Centrifugal Pump | PumpCatalog.com
Answer: End suction pumps shall be used for both the HSP and RO Feed pumps, Section 11200 will be revised in the conformed set.

27. Please refer to drawings G-3, C-1 and C-2. Drawing C-1 states an existing well pump #1(offsite) to be relocated. Is the contractor responsible for the relocation of existing well pump #1 or will this be done by the city and connected by the contractor? Will the existing on site well pump #2 stay in place? Please clarify.
Answer: Both Well 1 and 2 are artesian. The offsite well No. 1 is some distance away from the site and has a pump onsite (as shown) that conveys the flow the remaining distance through the plant. The building is shown for demolition therefore, as stated, this pump shall be relocated by the contractor as shown.

28. Has the owner already purchased the MCC equipment and generator? If so, please provide an expected delivery timeframe.
Answer: Both the electrical equipment and generator, fuel tank and ATS have been issued Purchase Orders. Lead times are listed in the bill of materials from the Suppliers. Generator (26-28 weeks), Fuel Tank (18-20 weeks), ATS (16-18 weeks). MCC (50-62 weeks) for all equipment listed.

29. The quote for the generator calls out an addition of "Stand Alone Fuel Tank 1,000-gallon 44 hour Convault with Stainless Steel Fittings". There is no spot for a fuel tank on the drawings. Please confirm if the owner has elected that option.

Answer: Confirmed. Contractor shall include a cost for a 12'X4'X1' slab extension with #6 rebar at 10" OC/EW/EF. Contractor shall also include #6 epoxy dowels at 10" OC for 12' in length with a 1-ft embedment. Coordination in construction with equipment suppliers will be provided, and updated drawings will be provided to the contractor.

30. Please provide a detail for the Duplex Drain Station. Is there to be a FRP enclosure similar to the duplex grinder pump station?
Answer: Detail is provided on CD-3.

31. Is RO Feed Pump #3 intended to be a future installation? Sheet M-1 shows as new with a blind flange on the piping for a future RO feed line. Sheet E-2.6 shows RO Feed Pump #3 as a future installation.
Answer: No, all three feed pumps will be installed, piping is interconnected. E-2.6 will be revised in conformed set.

32. The quote provided shows the surge protection as an external attachment to MCB-1. Plans show the surge protector is mounted internally in MCB-1. Please clarify.
Answer: The Contractor shall include labor for either installation as an internal or external surge protector. The equipment will be provided by the Owner and the Contractor will be provided approved shop drawings during construction for coordination.

33. Will the owner be clearing everything out of the storage area and organizing the existing plant storage prior to demolition, or should the contractor anticipate removing all the storage materials and haul them off to the owner provided salvage location?
Answer: Coordination can be handled after project is awarded however it will not be the responsibility of the Contractor to move/organize/disposal of the storage materials.

34. Will the owner, or contractor, be responsible for covering the cost of filling the generator fuel tank and chemical tank after testing and/or relocation?
Answer: (Section 16231) Fuel and chemicals are provided by County.

35. Is it in the CSI's scope to perform integration with the existing VT Scada system or is this work being performed by others?
Answer: See Revisions/Clarifications No. 3.

SUBMITTAL DEADLINE FOR BIDS REMAINS: WEDNESDAY, AUGUST 12, 2026 @2:00 PM (EDT)

END OF ADDENDUM NO. #01

IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

REVISED OFFICIAL COUNTY BID FORM (Addendum #01)
ST. JOHNS COUNTY, FLORIDA

PROJECT: NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

TO: THE BOARD OF COUNTY COMMISSIONERS OF ST. JOHNS COUNTY, FLORIDA

DATE SUBMITTED: _____

BID PROPOSAL OF

_____

Full Legal Company Name

_____

Mailing Address Telephone Number Email

Bidders: Having become familiar with requirements of the project, and having carefully examined the IFB Documents and Specifications entitled for I**FB No: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS** in St. Johns County, Florida, the undersigned proposes to furnish all materials, labor and equipment, supervision and all other requirements necessary to comply with the Contract Documents to submit the following Bid Proposal summarized as follows:

LUMP SUM BASE BID PRICE: All cost for all labor, materials, equipment, supplies, taxes, other miscellaneous costs, profit, and overhead, both direct and indirect, for completion of all Work except for those Bid Items herein listed separately.

$_____

Lump Sum Base Bid Price (Written in Numerals)

$ _____/Dollars

Lump Sum Base Bid (Written in Words)

Allowance #01: Florida Power and Light Involvement **$10,000.00**
Allowance #02: AT&T Involvement **$20,000.00**

TOTAL BID PRICE: Total amount calculated by adding the Lump Sum Base Bid, Allowance 1, and Allowance 2 amounts together to determine the Total Bid Price for completion of this Project.

$ _____

Total Bid Price (Written in Numerals)

$_____/Dollars

Total Bid Price (Written in Words)

IFB NO: 2995; NORTH BEACH WATER TREATMENT PLANT IMPROVEMENTS

REVISED OFFICIAL COUNTY BID FORM (Addendum #01)(CONTINUED)
ST. JOHNS COUNTY, FLORIDA

BID ALTERNATE #01 TOTAL LUMP SUM BID: All costs for all labor, materials, equipment, supplies, taxes, other miscellaneous costs, profit, and overhead, both direct and indirect, for completion of the following work identified in Exhibit A:

1. New degasifier (aeration) system and blower, equipment pad, associated valves and piping.
2. Pumps from new aeration system to existing GST's.
3. Odor control system and associated valves and piping.
4. Demolition of the existing aeration system and clear well.

$_____
Bid Alternate #01 Total Lump Sum Bid (Written in Numerals)

$_____
Bid Alternate #01 Total Lump Sum Bid (Written in Words)

Bidder shall insert the Bid Alternate(s) Price above, in numerals and in words. Failure to provide Bid Alternate pricing for consideration shall deem the Bid unresponsive.

ADDENDUM #02

August 6, 2026

To: **Prospective Bidders**
From: **St. Johns County Purchasing Department**
Subject: **IFB No: 2995; North Beach Water Treatment Plant Improvements**

This Addendum #02 is issued for further Bidders' information and is hereby incorporated into the Bid Documents. Each Bidder must incorporate any and all revisions, clarifications, and/or supplemental information provided in all issued addenda with the submitted Bid. Bidders must complete and submit Attachment "O," acknowledging all issued addenda with their Bid as provided in the IFB Documents.

Revisions/Clarifications:
The County provides the following revisions and/or clarifications to be incorporated into the Bid Documents:

1. Add Section 05450 Pre-Engineered Light Gage Steel Trusses to Exhibit A – Project Manual North Beach Water Treatment Plant – June 2026 contained in this Addendum.

2. Control Instruments, Inc. is hereby added as a pre-approved Controls System Integrator (CSI) under Exhibit A – Project Manual, North Beach Water Treatment Plant, June 2026, Section 16900, 3.02 Control System Integrator Qualifications.

3. All references to Section 03446 from Exhibit A – Project Manual, North Beach Water Treatment Plant, June 2026.

Questions/Answers:
The County provides the following answers to the questions submitted below:

1. Specification section 03446 - Specialty Coatings and Linings is mentioned several times in the specification and does not appear to exist. Please provide the spec section or clarify the interior coating or lining of the wet wells under the bid alternate.
   Answer: Section 03446 was removed because it was not applicable to the scope of this project. See Revisions/Clarifications #3. Contractor can reference SJCUD's latest standards manual and Approved Materials List for specialty coatings and linings at https://www.sjcfl.us/utility-development-group/.

2. Specification page 09900-16, Section C - Finishing Schedule appears to contain a painting schedule that does not apply to this project. Please clarify.
   Answer: This specification contains requirements and information that extend beyond the needs of this project. The Contractor shall apply the applicable portions of this specification as necessary to support the work. If there is something that does not apply, it should be ignored. Additionally refer to other specification sections for coatings applicable to the component, example Pre-engineered Metal Building.

3. Specification section 05450 - Light Gauge Steel Trusses appears in the table of contents, but the section is not provided in the specifications.
   Answer: See Revisions and Clarification #1. The section will be in the final Conformed Specifications.

4. Specification section 03310 states that all new concrete slabs receive a curing/sealing system. Spec section 09900 states that all interior concrete substrates receive a multi-coat epoxy/urethane coating system. These two systems generally cannot be installed together. Please indicate which applies.
   Answer: 03310 refers to slab on grade whereas 09900 refers to structures in contact with water.

5. What is the eave height for the Treatment Building?
   Answer: See Drawings A-5, A-6 and A-7 for minimum elevations. The Contractor will need to coordinate with the PEMB supplier and adjust based on primary and secondary framing as well as point loads.

6. The base plate on FL-5 Sheet S-6 is below the finished floor of the rest of the building. What is the dimension of the drop down?
   Answer: Correct, the pumps are not located inside of the building, see sheet S-4, S-5, and S-6 for details. There are two distinct finished floor elevations.

7. Section 11680, Paragraph 1.01. B. 1 states "One single dual laminate degasifier vessel…." We recommend that the degasifier be a single material FRP vessel utilizing an NSF 61 compliant resin for all wetted surfaces.
   Please confirm that the FRP degasifier vessel may utilize NSF 61 certified resin for all wetted surfaces instead of PVC.
   Answer: Yes, FRP can be used.

8. Section 11680, Paragraph 1.01. B. 2 states "The FRP vessel shall be skid mounted and house both biological and polishing stages of treatment in a single vessel." A biotrickling filter only contains a biological stage and does not contain a carbon polishing stage. Please confirm that no carbon polishing stage is required.
   Answer: Correct, no carbon polishing stage is required.

9. Section 11680, Paragraph 1.01. B. 2 states "The FRP vessel shall be *skid mounted* and house both biological and polishing stages of treatment in a single vessel." Drawing M-5 and M-6 do not depict any skid for the vessels or controls to be mounted on. Please confirm that the vessels/controls are not to be skid mounted and are to be mounted on a concrete pad.
   Answer: Correct, vessel is mounted on concrete pad. The term "skid" just refers to preassembling as much as possible prior to arriving onsite.

10. Section 11680, Paragraph 1.08. B states "The degasifier and biotrickling filter Manufacturer shall warrant the synthetic media against defects in material and workmanship for ten (10) years from equipment startup."
    Please confirm that this applies to the biotrickling filter media and not the degasifier media.
    Answer: Both medias shall be warranted for 10 years.

11. Section 11680, Paragraph 2.04. A "Inlet Water Quality" table does not contain important parameters for degasifier design like water temperature, alkalinity, and hardness. Please provide the minimum temperature, maximum alkalinity, and maximum hardness values for the influent water.
    Answer: This information varies, the well water quality was estimated during design. The inlet to the degasifier/ odor control is based on blended water from the RO skid system and raw well water. Please see the table below.

Parameter	Value	Units
pH	7.6	-
Temperature	77 (25)	°F (°C)
Hardness	400	mg/L
Sodium	68.4	mg/L
Calcium	78.5	mg/L
Carbonate	0.5	mg/L
Bicarbonate	160	mg/L
Magnesium	50	mg/L
Chloride	65.80	mg/L

12. Section 11680, Paragraph 2.04. A "Inlet Water Quality" table lists values for pH and Hydrogen Sulfide. Please confirm that these are provided as maximum values.
    Answer: See question 12.

13. Section 11680, Paragraph 2.04. A "Vessel Design" table states that the biotrickling filter diameter is to be Ø7'. Drawings M-5 and M-6 show the biotrickling filter being Ø9'. Please confirm the maximum diameter for the biotrickling filter.
    Answer: Assumed design was based on 9-ft diameter.

14. Section 11680, Paragraph 2.04. A "Vessel Design" table gives a recirculation rate for the biotrickling filter. Please confirm a once-through biotrickling filter may be used.
    Answer: Once through biotrickling filter may be used if it meets the performance requirements stated in the specification.

15. Section 11680, Paragraph 2.04. A "Three Phase Equipment" table states that the Forced Draft Fan Capacity should be 4,500 cfm. This conflicts with the design airflow in the above tables for the degasifier and biotrickling filter. Please confirm that the fan should be designed for 3,000 cfm.
    Answer: Tables to be revised, forced draft fan shall be 4,500 CFM.

16. Section 11680, Paragraph 2.04. B. 1. a/b. states "H2S removal efficiency is ≥ 88% for inlet air H2S concentrations ≥ 50 ppmv but ≤ 300 ppmv." Please confirm that the "≥ 88%" or ≤ 0.5" should be "≥ 99.5% or ≤ 0.1"
    Answer: minimum efficiency is 88%.

17. Section 11680, Paragraph 2.04. C. 1. c & d. reference odor removal requirements as ≥ 95% or ≤ 200 D/T. "Odor" removal requirements and olfactometry testing as specified is typical for wastewater applications where there is an expectation of organic reduced sulfur compounds in addition to the hydrogen sulfide. That is not the case here. Please confirm that the bag sampling and odor removal performance requirements are not required for this application.
    Answer: Odor control testing is required as detailed in the specifications.

18. Section 11680, Paragraph 2.05. E. 1. b. states “Variable frequency drives (VFD) shall be provided in the ECP for the control of the exhaust fan.” VFDs can be provided but it is not typical for a degasifier application, since the degasifier and biotrickling filter designs are based on a single airflow rate. Please confirm if a VFD is or is not required.
Answer: No VFD required for blower.

19. Section 11680, Paragraph 3.04. H – Odor Testing Procedure - Please confirm that this testing is not a part of this project.
Answer: System testing to demonstrate all parts are working as expected with the performance and design as stated in Section 2.04 must be met.

20. Section 15892, Paragraph 1.04. B. 1. requires damper leakage tests to be performed by an AMCA certified laboratory. Please confirm that AMCA approved leakage testing per AMCA 500-D, demonstrating compliance with AMCA leakage rates, can be performed by a non-AMCA certified laboratory.
Answer: Damper testing shall be performed using the procedures outlined in AMCA 500-D however the laboratory does not have to be AMCA certified.

21. Section 15892, Paragraph 2.01. A. lists acceptable FRP ductwork manufacturers. Please confirm that it is acceptable for the FRP ductwork to be fabricated by the degasifier / biotrickling filter vessel fabricator.
Answer: Section 15982 is for FRP ductwork, the degasifier and filter supplier may fabricate the FRP ductwork and shall abide by all conditions within 15892 as far as material procurement and execution.

22. Section 15892, Paragraph 2.03. A. 3. i. lists acceptable manufacturers of FRP dampers as Swartout or Belco. We would like to request that BioAir Solutions be added as an acceptable damper manufacturer.
Answer: BioAir Solutions is an acceptable manufacturer and listed in 11680. Damper is included in 11680.

23. Drawings M-6. Shows the influent water flange at 22.33’.
11680 Paragraph 2.04. A “Vessel Design” table states the Mass Transfer Packing Depth is to be 19.5’
These elevations do not work for the design of the vessel with the provided airflow rate.
Please confirm that the influent water flange elevation is approximate and can be slightly higher.
Answer: See Answer to Question# 16. The influent elevation can be revised during the shop drawing process.

24. Specification section 13125 states that the secondary framing system is a Varco Pruden Building Framing System. The specification for the Pre-Engineered Metal Building (PEMB) has several other vendors listed, does this requirement nullify the other listed manufacturers in the spec and require the PEMB to be a Varco Pruden product?
Answer: Varco Pruden was used as the basis of design however the other vendors listed are acceptable alternatives. Manufacturers listed as approved may utilize their specific design details with the exception of tapered columns where they may foul with available floorspace or piping. The PEMB shall incorporate all components into an envelope submittal package including but not limited to, doors, trusses, openings, jambs, and any secondary or primary framing.

25. Section 11200, 03.A–C and 2.02.A.1 — Basis-of-design pumps are end-suction, single-suction units, but spec calls for split-case, double-suction pumps. Please confirm intended pump type and revise spec language accordingly.
Answer: See Answer to Question #26 in Addendum #01.

26. Section 11200, 1.03.E — Please confirm chlorine compatibility (2–4 mg/L continuous, 15–20 mg/L initial disinfection) has been evaluated for the BOD pump model. Close-coupled version with ANSI 1045 carbon steel shaft is not corrosion resistant.
    Answer: HSPs pumps shall be capable of handling chlorinated water, close coupled end suction pump that is NSF 61 certified. Contactor is responsible for providing a pump that meets the requirements stated within the specification – if the BOD pump cannot meet the requirements, contractor to provide alternative. There is no expectation that 15-20 mg/L will be experienced by the pump. MRDL level is 4.0 mg/L but expected to be far less.

27. Section 11200, 1.01.A vs. 1.03/2.02.A.1 — Spec describes both "horizontal (axially) suction" and "split case double suction" pumps. Please clarify which configuration governs.
    Answer: See Answer to Question # 26 in Addendum #01.

28. Section 11200, 2.02.C.6, 2.02.C.7, and 3.02 — These sections along with plan drawings presume a frame-mounted, separately coupled unit, but BOD data lists close-coupled construction. Please confirm which design is required.
    Answer: See Answer to Question # 26 in Addendum #01.

29. Section 11200, 2.02.C.4.a — Pump shaft is specified as ASTM A582, 416 SS. BOD pump model has ANSI 1045 Carbon Steel motor shaft with no pump shaft since it close-coupled. Frame mounted option has ASTM A108 carbon steel pump shaft. Confirm which material is required.
    Answer: ANSI 1045 motor shaft is acceptable since closed coupled.

30. Section 11200, 2.02.C.5.b–c — Spec requires API Plan 11 external seal flush piping with a drilled/tapped 316SS seal gland (two flush ports, 180° apart). The BOD pump model cannot meet this requirement. Please confirm whether Plan 11 flush is a hard requirement, or whether a plain/unflushed Type 21 seal chamber is acceptable.
    Answer: Plain/unflushed type 21 seal chamber is acceptable.

31. Section 11200, 1.03.D and 1.06.B — Two of three submitted seal configurations use Buna-N, which is excluded from factory NSF 61 certification. Please confirm acceptability of upgrading to EPR or Viton.
    Answer: Confirmed.

32. Section 11200, 2.02.C.5.a — Spec requires EPDM seal elastomer; Basis of design pump model number indicates Buna-N. Please confirm whether EPR is an acceptable substitute.
    Answer: Confirmed.

33. Section 11200, 2.02.C.1.g — Wear rings specified as Nitronic 60 or 400-series SS; standard construction uses bronze. Please confirm whether bronze wear rings are acceptable or SS is required.
    Answer: Bronze is acceptable.

34. Section 11200, 2.02.C.2.a — Impeller specified as ASTM C95800 nickel-aluminum bronze or 316 SS; BOD standard offering is ASTM B584 Modified C87500. Please confirm requirement.
    Answer: ASTM B584 modified C87500 is acceptable.

35. Section 11200, 2.03.A.1 — Spec requires ODP motor enclosure; submitted configurations list TEPE (totally enclosed). Please confirm whether ODP is required or TEFC/TEPE is acceptable.
    Answer: TEFC/TEPE is acceptable.

36. Section 11200, 2.03.A.1 — BOD model does not have a motor option to meet NEMA MG-1 Part 31.
Answer: TEFC/TEPE is acceptable.

37. Section 11200, Table 11200-2 — Minimum efficiency specified at 74.4% (RO Feed); submitted selection shows 73.9%. Please confirm acceptable tolerance per HI 14.6 Acceptance Grade 2B.
Answer: Confirmed.

38. Section 11200, Table 11200-3 — Minimum efficiency specified at 73.1% (GST Feed); submitted selection shows 73.01%. Please confirm acceptable tolerance per HI 14.6 Acceptance Grade 2B.
Answer: Table 11200-3 shall not be used, GST pumps are vertical turbine can pumps, refer to Section 11214.

39. Section 11200, Table 11200-1 — Submitted NPSHr equals the specified maximum with zero margin. Please confirm available NPSHa at the suction source provides adequate margin.
Answer: The pumps are fed exclusively by GSTs that will frequently feature flooded suction conditions. Allowable and maximum NPSHr can be the same.

40. Section 11200, Tables 11200-1/2/3 — Please clarify whether "minimum pump shutoff head" refers to true zero-flow shutoff or head at minimum continuous stable flow (H@QMin).
Answer: Confirmed zero-flow shutoff.

41. Section 11200, 2.02.C.6.d and 3.02 — If close-coupled construction is confirmed, please issue an addendum striking non-applicable coupling guard/alignment requirements.
Answer: Confirmed, specification will be revised during the conformed document process. The contractor/supplier will not have to verify alignment for a close coupled pump.

42. Section 11200, 2.02.B.4.a / Table 11200-1, 11200-2, 11200-3 (footnote 1) - Spec requires HI Acceptance Grade 1E; BOD pump manufacturer's standard is fixed at Grade 2B. Does the Engineer accept Grade 2B testing, or is Grade 1E testing mandatory?
Answer: Grade 2B is more stringent than 1E; therefore it is acceptable.

43. Section 11200, 2.02.B.4.a.i - Spec requires 36 data points (6 points × 6 speeds, 50–100% VFD speed in 10% increments) plus vibration readings at AOR/POR/BEP boundaries at each speed. BOD pump manufacturer certifies a single named duty point at fixed speed. Is the full 36-point variable-speed test regime mandatory?
Answer: It is incumbent on the supplier to provide a test plan that demonstrates compliance with the specifications. The requirement to demonstrate successful operation at varying pump speeds without exceeding the maximum allowable vibration is fundamental to pump acceptance. A revised VFD test regime can be determined during shop drawing and testing during construction.

44. Section 11200, 2.02.B.4.a.c / 1.06.H - Spec requires that a pump failing to meet specification during factory test be reviewed with the Engineer and modified/retested. BOD pump manufacturer cannot meet this requirement.
Answer: A failed factory test for a pump will not be permitted to be shipped/installed.

45. Section 11200, 3.03.A – BOD pump manufacturer can only 1.3× maximum working pressure. Is this acceptable?
Answer: It is unclear what the reference is for this question, 3.03.A refers to shop painting.

46. Section 11200, 2.02.B.4.a.ii – BOD pump manufacturer cannot meet this requirement.

Answer: All pumps will be required to perform factory tests and meet the requirements identified in Table 11200-1.The pump needs factory testing regardless of the Supplier and needs to go through the appropriate manufacturer who can get the pump tested at the factory.

47. **Section 11200, 2.02.C.1.c -** Spec requires NSF 61 epoxy-lined casing interior; BOD standard construction is bare cast iron. Please confirm whether an epoxy lining is required.
    Answer: Epoxy lining shall be provided.

48. **Section 09900, 2.03 –** Which product governs pump casing shop/field painting? Or is 3.05.A.1.b requiring pump manufacturer's standard and Contractor's field topcoat of choice?
    Answer: 11200 3.03/3.04, shop and field painting as noted in the pump specification shall govern.

49. **Section 09900, 2.01.A –** BOD pump model cannot be provided with Tnemec paint product. Please confirm if OEM paint is acceptable.
    Answer: Tnemec paint can be field applied and should be coordinated with both Tnemec and pump supplier.

50. Can you tell me where in the Addendum it mentions vertical turbine pump cans and which drawing shows vertical turbine pumps. I see that question 25 refers to vertical turbine pumps**.**
    Answer: The project consists of standard vertical turbine pumps installed in concrete wetwells for each pump. There will not be "an" pumps or another housing to the VTPs.

SUBMITTAL DEADLINE FOR BIDS IS HEREBY EXTENDED TO: WEDNESDAY, AUGUST 19, 2026 @2:00 PM (EDT)

END OF ADDENDUM #02

SECTION 05450

PRE-ENGINEERED LIGHT GAGE STEEL TRUSSES

PART 1 - GENERAL

1.01 SUMMARY

A. Description of scope and intent:
   1. CONTRACTOR shall provide all material, labor, and tools required to complete the installation of specified system.
   2. Any omission of reference to items required to complete the full operational and functional system specified in the section does not relieve the CONTRACTOR of the obligation to provide same.
   3. To provide installation of all items, including delivery, dispersing to the proper locations within the building, and affixing in place.
   4. Installation shall be accomplished by workers skilled in their craft who will perform their work in a professional manner and will leave the premises safe, orderly and clean.
   5. Drawings and general provisions of Contract, including EJCDC General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section
   6. CONTRACTOR is responsible for coordination of work included in this specification with all other specification sections related to furnishing of all materials, labor, permits, fees and services necessary for completion of work in this section.

B. Section includes all work and supplementary items required to complete the proper installation of the pre-engineered light gauge roof trusses as shown on the Contract Documents and specified herein including headers, outriggers, supplemental rafters and incidental framing for a complete assembly within the extent shown on the drawings.

C. Section Includes: Pre-engineered light gauge steel stud trusses consisting of welded, screwed or bolted connected members which are fabricated, cut and assembled prior to delivery.
   1. Gable-shaped trusses
   2. Monopitch trusses
   3. Irregular shaped trusses

1.02 REFERENCES

A. Comply with the following documents, except where requirements of the Contract Documents or of governing codes and governing authorities are more stringent. All referenced standards refer to the edition in force at the time these Drawings and Specifications are issued.
   1. AISI – American Iron and Steel Institute; Specification for the Design of Cold-Formed Steel Structural Members
   2. AISI – American Iron and Steel Institute; Design Guide for Cold-Formed Steel Trusses
   3. ASTM A370 – Standard Test Methods and Definitions for Mechanical Testing of Steel Products.
   4. ASTM A500 – Standard Specification for Cold-Formed Welded and

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Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

5. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated by Hot-Dip Process.
6. AWS D1.0 – “Code for Welding in Building Construction”.
7. ANSI Z49.1 – “Safety in Welding and Cutting”.

1.03 DEFINITIONS

A. Truss Manufacturer: The approved truss manufacturer who assembles Truss Component Manufacturer’s components into complete trusses.

B. Truss Specialty Engineer: The specialty engineer having responsibility for the design of the light gauge steel trusses.

1.04 SYSTEM REQUIREMENTS

A. Design Requirements: Provide Pre-engineered light gauge steel truss system which is designed and fabricated to comply with the requirements of the Contract Documents and which strictly conforms to material, manufacturing, and erection requirements of the Truss Manufacturer, and Truss Specialty Engineer and which meets the following:
   1. Wind Uplift and Shear: Design trusses, truss to truss connections, and truss to structure connections to comply with the wind criteria indicated in the structural drawings.
   2. Gravity Loads: As indicated on the drawings.
   3. Truss Spacings: As indicated on the drawings.
   4. Fire Classification: Non-combustible
   5. Screwed Connections: Yes
   6. Interior Bearing: Yes at panel points only.
   7. Maximum Allowable Deflection: 1/360 of span, under total design loads.
   8. Maximum Allowable Deflection: 1/240 of span, under live loads only.

B. Performance Requirements: Truss system, with framing components and accessories, shall provide a complete horizontal framing system, ready for deck installation, meeting the specified Design Requirements. Shim as required to provide uniform and smooth transitions between adjacent trusses and between trusses and walls that extend to the roof deck.

C. Component Requirements: Truss chord and web components shall have rolled or closed edges to minimize the danger of cutting during handling. Chord and web components without rolled edges shall not be accepted.

D. Truss Configuration: Arrangement of web member shall be at the discretion of the design engineer. Coordinate web spacing as required for mechanical duct requirements. Joint centerlines of members shall intersect at a common work point or the Specialty Engineer shall consider imposed loads due to eccentricity in the truss design.

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SECTION 05450

PRE-ENGINEERED LIGHT GAGE STEEL TRUSSES

1.05 QUALIFICATIONS

A. The light gauge steel subcontractor shall have experience in fabrication and erection of light gauge steel truss and framing systems of scope and design similar to the required work.

B. Trusses shall be designed, fabricated, and erected by a firm which has a record including a minimum of five years of successfully designing, fabricating and erecting trussed assemblies similar to scope required and which practices a quality control program which includes inspection by an independent inspection and testing agency acceptable to architect and authorities having jurisdiction.

C. Manufacturers who wish to qualify for approval under this Section of the specification shall submit evidence of compliance with this specification to the Architect for acceptance.

1.06 SUBMITTALS

A. Product Data:
   1. Submit fabricator's technical data covering materials, shapes, hardware, fabrication process, handling and erection.
   2. Submit certificate, signed by an officer or subcontractor or fabricating firm, indicating that trusses to be supplied for project comply with indicated requirements.

B. Shop Drawings:
   1. Submit shop drawings showing shapes and dimensions of members to be used including pitch, span, camber configuration and spacing for each type or configuration of truss required.
   2. Show all bearing and anchorage details. Coordinate anchorage details with the information shown on the drawings. All anchorage to the structure shall conform to the intent of the drawings.
   3. Specify and detail all supplemental strapping, bracing clips and other accessories required for proper installation.
   4. Shop drawings shall include all placement sequences and instructions.
   5. Submit design analysis and test reports indicating loading, section properties, allowable stress, stress diagrams and calculations, and similar information needed for analysis and to insure trusses comply with requirements.
   6. All drawings and calculations shall bear the name and seal of a Structural Engineer licensed to practice in the state of Florida.
   7. Basis of design as indicated on drawings.

C. Quality Assurance
   1. Truss Manufacturer's Instructions: Printed installation instructions for each item of cold-formed metal framing and each accessory specified in this section.
   2. Design Data: Results of design analysis, bearing the seal and signature of a professional engineer registered in the state of Florida.

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D. Qualification Data: For firms and persons who wish to qualify for approval under this section of the specifications shall submit evidence of compliance with this specification to the Architect for acceptance.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle products in exact accordance with the manufacturer's latest published requirements and specifications to avoid damage from bending, overturning, or other cause for which truss in not designed to resist or endure. Storage shall be off-ground in a dry ventilated space or protect with waterproof coverings.

B. Time the fabrication and erection of trusses to avoid extended on-site storage and to avoid delaying work of other trades whose work must follow erection of trusses.

1.08 QUALITY ASSURANCE

A. Confer at job site prior to scheduled beginning of construction activities of this Section to review requirements of this Section. The following at a minimum shall attend:
   1. Truss installer.
   2. Installer of truss supports.
   3. Mechanical CONTRACTOR.
   4. Electrical CONTRACTOR.

B. Review potential interface conflicts:
   1. Coordinate layout and support provisions.
   2. Coordinate mechanical and electrical work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. The following are acceptable truss manufacturers of Light Gauge Steel Truss systems:
   1. Alpine Engineered Products, Inc.
   2. Nelson and Affiliates Light Gage Metal Trusses
   3. West Coast Florida Enterprises, Inc.
   4. Lamp Trusses
   5. Brannon Specialties Inc

B. Request for substitutions shall be considered in accordance with provisions of Division 1. All permitted equals must be approved in writing by the ENGINEER. Do not request substitutions via the shop drawing submittal process. All applications for substitution must include samples and technical data.

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2.02 COMPONENTS

A. Load bearing members: Mechanical properties of components shall be determined by testing conforming to ASTM A370- Standard Test Methods and Definitions for Mechanical Testing of Steel Products. Members shall be cold-formed to indicated sizes, profiles, and thickness of steel conforming to ASTM A653, minimum G60 coating, and ASTM A500 as follows:
   1. Chord materials:
      - Minimum yield strength 55,000 ksi.
      - 18 gage minimum
      - 4” minimum depth
      - Provide members of gage and shape required for unbraced lengths to equal or exceed 5’-0”.
   2. Web materials:
      - Minimum yield strength 45,000 ksi
      - 20 gage minimum
      - 4” minimum depth
      - Provide members of gage and shape required for unbraced lengths to equal or exceed 5’-0”.

B. Fasteners: All web to chord connections shall be made with the appropriate screw fasteners as recommended by the Truss Manufacturer. Number required shall be specified by each screw shall bear the stamp of the Truss Manufacturer for ready identification. Alternate fastening methods, such as welding, are not acceptable.

C. All trusses shall be hot-dipped galvanized using a minimum G60 coating.

2.03 FABRICATION

A. General: All materials shall be clean and straight.

B. Bridging is schematically shown on drawings. Detail and fabricate bridging in complete accordance with AISI and the Truss Manufacturers recommendations.

C. Light Gauge Steel Trusses
   1. Shop fabricate from cold-formed steel components in accordance with shop drawings, using jigging systems to ensure consistent component placement and alignment of components, and to maintain specified tolerances as shown below.
   2. Field fabrication of trusses is strictly prohibited.
   3. Camber: Comply with the recommendations of the Truss Specialty Engineer.
   4. Shop fabrication of other cold-formed steel framing components into assemblies prior to erection is permitted.
   5. Splices shall not be used except as authorized by the Truss Specialty Engineer.
   6. Provide all clips, angles, and other miscellaneous pieces necessary to fabricate and erect the trusses and to connect trusses to the structure and to one another.

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2.04 SOURCE QUALITY CONTROL

A. Material Tolerances: Steel for cold-formed chord and web components:
   1. Nominal 20 gauge members:
      a. Minimum bare metal thickness: 0.033 inch.
      b. Maximum design thickness: 0.035 inch.
   2. Nominal 18 gauge members:
      a. Minimum bare metal thickness: 0.043 inch.
      b. Maximum design thickness: 0.047 inch.
   3. Nominal 16 gauge members:
      a. Minimum bare metal thickness: 0.054 inch.
      b. Maximum design thickness: 0.059 inch.

B. Assembly Tolerances: Fabricate truss assemblies to tolerances of maximum variation from plumb, level, or true line as indicated below:
   1. Trusses up to 30 ft in length - maximum 1/4 inch variation from design length.
   2. Trusses over 30 ft in length - maximum 1/2 inch variation from design length.
   3. Trusses up to 5 ft in height - maximum 1/8 inch variation from design height.
   4. Trusses over 5 ft in height - maximum 1/4 inch variation from design height.

C. Material Certification: Provide Truss Manufacturers material certification.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Visually examine and verify that receiving surfaces of the substructure have no apparent defects or errors which would result in substandard workmanship. Additionally, the following items shall be installed and inspected prior to roof truss installation.
   1. Exterior bearing plates
      a. Properly positioned within CMU wall cap beam.
      b. Installed so as to allow complete and adequate contact with truss connection member.
   2. Interior bearing plates
      a. Properly positioned within CMU wall cap beam or on precast hollowcore.
      b. Installed so as to allow complete and adequate contact with truss connection member.
   3. Report any unsatisfactory conditions to the ENGINEER.

B. Installer's Examination:
   1. Installer of this section shall inspect conditions under which construction activities of this section are to be performed, then submit written notification if such conditions are unacceptable to installer.
   2. Installer shall transmit two copies of inspection report to ENGINEER within 24 hours of inspection.
   3. Beginning construction activities of this section before unacceptable conditions have been corrected is prohibited.

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4. Beginning construction activities of this section indicates installer's acceptance of conditions.

3.02 INSTALLATION

A. Field Fastening: Use correct fastening of trusses to structure as specified by the Specialty Engineer.

B. Metal Trusses:
   1. Install trusses in accordance with the Truss Manufacturer's instructions and recommendations. Place components at spacings indicated. Install temporary bracing as required. Temporary bracing shall support trusses straight and plumb and in safe condition until decking and permanent truss bracing is securely installed. All CONTRACTORs shall use proper construction procedures to insure adequate distribution of construction loads so as not to exceed design loads.
   2. Install required permanent bracing as indicated on the drawings in addition to the permanent bracing or bridging required by the Truss Manufacturer. All bracing and or bridging shall be installed prior to application of loads.
   3. Field cutting or alterations of the trusses or bracing is prohibited.
   4. Damaged trusses shall be repaired of replaced as directed by the Truss Specialty Engineer.
   5. All trusses shall be installed by approved methods using equipment of adequate capacity to safely perform the work.
   6. Provide web stiffeners and reinforcement at reaction points where required by the Truss Specialty Engineer.

C. Site Tolerances for Truss Bearings:
   1. Variation from level or specified plane: maximum 1/8 inch in 10 ft.
   2. Variation from specified position: maximum 1/4 inch.
   3. The CONTRACTOR shall be responsible for checking the dimensions and spacings indicated on the drawings.

3.03 FIELD QUALITY CONTROL

A. General: CONTRACTOR shall engage a qualified independent testing agency to perform field quality control testing as indicated below:
   1. Verify locations, sizes, and spacing of trusses.
   2. Inspection of truss to truss and truss to structure connections.

B. Provide access for independent testing agency so that inspections can be accomplished safely.

END OF SECTION 05450

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ADDENDUM #03

August 14, 2026

To: **Prospective Bidders**
From: **St. Johns County Purchasing Department**
Subject: **IFB No: 2995; North Beach Water Treatment Plant Improvements**

This Addendum #03 is issued for further Bidders' information and is hereby incorporated into the Bid Documents. Each Bidder must incorporate any and all revisions, clarifications, and/or supplemental information provided in all issued addenda with the submitted Bid. Bidders must complete and submit Attachment "O," acknowledging all issued addenda with their Bid as provided in the IFB Documents.

Revisions/Clarifications:
The County provides the following revisions and/or clarifications to be incorporated into the Bid Documents:

1. Minimum qualification stating "Bidder or Subcontractor must be a Certified Building Manufacturer (MB) and Certified Erector (ME) in the State of Florida" is being removed. Part 1- General Terms and Conditions, Section 23 – Minimum Qualifications is revised to state the following:

   23) MINIMUM QUALIFICATIONS
   The following are minimum qualification requirements that Bidders must meet in order to be considered responsible to perform the work specified in this IFB. Bidders must submit sufficient documentation in their Bid Submittal, to clearly demonstrate that the Bidder meets or exceeds the following minimum qualification requirements:

   a) Bidder must be **actively registered with the State of Florida Division of Corporations** as of the submittal deadline for Bids; and

   b) Bidder must provide a copy of a **current Local Business Tax Receipt from St. Johns County** or from the local jurisdiction in the State of Florida where the Bidder's permanent business location or branch office is maintained, or provide written exemption from the SJC Tax Collector's Office. If Bidder does not possess a current Local Business Tax Receipt from St. Johns County or from their local jurisdiction, as provided above, Bidder must obtain such required Local Business Tax Receipt upon notification of the County's intent to award the Bidder.

   c) Bidder must be currently licensed as a **Certified General Contractor (CGC) in the State of Florida** as of the submittal deadline for Bids.

   d) **Bidder must submit a list of any and all relevant experience with the proposed scope of work and shall illustrate that they have the required experience with structural work associated with Water Treatment Plants as listed in Exhibit A within the past 5 years (submit with Attachment "C" – License/Certification List)**. The list must include the Client's information, total contract value, completion timeframes and Architect/Engineer of record with the bid. The Experience submitted shall be evaluated to determine whether or not Bidder is responsible to complete the Work. The County reserves the right to check any and all references. Failure to submit documentation to demonstrate experience as stated above shall cause a Bid to be disqualified.

e) **The Bidder is to submit a Letter of Bonding Capability and Capacity from the Bidder's Surety (not the agent) demonstrating the level of bonding capability/capacity held by the Bidder is a minimum of $4 million dollars.** Surety must be licensed to do business in Florida, have been in business and have a successful continuous operations for at least three (3) years. Surety shall not have exposed itself to any loss on any one risk in an amount exceeding twenty percent (20%) of its surplus to policyholders. Surety must have fulfilled all of its obligations on all other bonds given to the Owner. Surety must have good underwriting, economic management, adequate reserves for undisclosed liabilities, net resources for unusual stock, and sound investment and have an "A" rating or better.

f) Bidders must provide proof of qualifications by completing and submitting **Attachment "C" – License/Certification List** along with a copy of each required license and certificate listed or a letter from FDOT confirming pre-qualification in the required work classes. All licenses, certifications, and FDOT pre-qualifications must be valid and current on the date bids are submitted. A copy of the form, **Attachment "C"** – License/Certification List, is provided in the IFB Document for Bidders to provide proof of the Minimum Qualifications stated above.

FAILURE BY A BIDDER TO DEMONSTRATE MEETING OR EXCEEDING THE MINIMUM QUALIFICATION REQUIREMENTS STATED ABOVE SHALL BE GROUNDS FOR DISQUALIFICATION AND REMOVAL FROM FURTHER CONSIDERATION FOR AWARD. The County reserves the right to request additional information regarding the qualification and experience of the Bidder in order to determine the responsibility of the Bidder to perform the specified work.

Bidders to whom award of a contract is under consideration shall submit to the County, upon request, a properly executed Contractor's Qualification Statement of A1A Document A305, or other similar forms, unless such a statement has been previously required and submitted by Bidder for this IFB.

SUBMITTAL DEADLINE FOR BIDS REMAINS UNCHANGED: WEDNESDAY, AUGUST 19, 2026 @2:00 PM (EDT)

END OF ADDENDUM #03