CITY OF TAMPA

Bob Buckhorn, Mayor **CONTRACT ADMINISTRATION DEPARTMENT**

Michael W. Chucran, Director

ADDENDUM 2

August 29, 2018

Contract 15-C-00044; Louisiana Pump Station Rehabilitation

Bidders on the above referenced project are hereby notified that the following addendum is made to the Contract Documents. BIDS TO BE SUBMITTED SHALL CONFORM TO THIS NOTICE.

Item 1: Clarification Statement- Specification 26 23 13 480 Volt Switchgear: Switchgear and motor control equipment is not standardized. Cutler Hammer equipment was used as the basis of design. Other brands are acceptable as long as they meet the specifications and will fit in the allotted space.

Item 2: Add the attached Standardizations:

ABB Electromagnetic Flow Meter
Maple System NMI
Dezurik Valve Standard
Fairbanks Morse Pump
Yaskawa VFD
GE PLC

Item 3: Structural Specifications: Section 05120, 3.2 QC A– Revise the first sentence to read: “The Contractor will engage an independent testing and inspection agency …”

Item 4: Replace Electrical Specifications Section 26 00 13 with the attached Section 26 00 13.

Item 5: Architectural, HVAC and Plumbing:

a. Section 08 51 13 – 1.01 D1 revise to read: “Provide projected and fixed window units meeting 2017 Florida Building Code, Miami-Dade County (NOA Certification) for Large Missile Rating (hurricane) as indicated in 2.02A.”

b. Replace Sections 22 00 00, 22 02 00, 22 08 00, 22 10 00, 22 20 00, 22 21 00, 23 00 00, 23 01 00, 23 08 00, 23 41 00, 23 42 00, 23 70 00 and 23 95 00 With Attached Sections 22 00 00, 22 02 00, 22 08 00, 22 10 00, 22 20 00, 22 21 00, 23 00 00, 23 01 00, 23 08 00, 23 41 00, 23 42 00, 23 70 00 and 23 95 00.

Item 6: Electrical Plans: Replace plan sheets E-3 and E-11 with attached plan sheets E-3 and E-11.

Item 7. Mechanical Plans: Replace plan sheet V0.1 with attached plan sheet V0.1.

Item 8: Replace the following Instrumentation Specifications with the attached:

25 31 01 Field Instruments
25 31 03 Programmable Logic Controllers.

Item 9: Add the attached Geotechnical report.

Item 10: Delete Section 41 22 14 Transfer Cart

Item 11: Replace SP-55 Electrical Requirements with the attached SP-55.

Item 12: Replace Section W-58 - Sewage Pumping Equipment with the attached Section W-58.

Item 13: Add the following Standard W&M Sections:

1. W-1 Excavation – Earth & Rock
2. W-2 Backfilling
3. W-8 Metal Castings
4. W-10 Ductile Iron Pipe and Fittings
5. W-14 Pipe Cradles and Encasement
6. W-15 Laying and Jointing Pipe for FMs and Sewers
7. W-18 Leakage Tests
8. W-27 Demolition
9. W-30 Miscellaneous Pipe and Fittings
11. W-31 Hangers and Supports
12. W-58 Sewage Pumping Equipment
13. W-73 Restraining Devices

Item 14: See Specific Provision SP-21 Bypass Pumping for power requirements. The TECO contact information is:

Brock Blackmore
Project Manager New Construction
Tampa Electric
702 North Franklin St
Tampa, Florida. 33602
813-228-1008 Office
813-610-1192 Cell
btblackmore@tecoenergy.com

Item 15: Plan Sheet E-3, Note 16, Change the first sentence to read: The existing bubbler/pump control cabinet, located on the upper level of the pump station, shall be replaced as indicated on the drawings.

Item 16: Insert, following page INS-2, the attached MBD Form-70.

Item 17: Insert, following page GCL-Instructions, the attached Form MBD-40, Letter of Intent.

Item 18: Questions and Answers

Q- Can the 30% U-WMBE-BBE goal be reduced to 15%?
If the U-WMBE-BBE goal cannot be met, will MBE/WBE and SLBE qualify for the goal?

A- Response/Clarification:
City Code stipulates that bidders execute GFECP toward attainment of the narrowly-tailored goal established for the underutilized subcontract category(s). MBD Form-50 (GFECP) is the instructional guide that articulates meaningful action steps must be taken that represent valid attempts to first solicit and utilize U-WMBEs. A demonstrable effort shall be evident to achieve the U-WMBE goal completely or in-part, not merely a pro-forma exercise. Nothing is to preclude other City certified WMBE/SLBE companies from being solicited and utilized. Miscellaneous WMBE/SLBE participation is expected, but will not satisfy the objective of the narrowly-tailored goal which is specific to the project currently solicited. Non-Compliance with City Code may occur when an audit concludes the bidder's effort was "Insufficient" (i.e. shallow/disingenuous, a formality).

The 30% goal has not been recalculated/revised. Constructive, timely outreach methods are mandatory and follow-up must be clear, concise and free of ambiguity (e.g. specificity required). Bidder should re-visit GFECP steps #2,3,5,7 and substantiate their actions. Additionally, the "contact list" provided with the bid is a benchmark representing the minimum U-WMBE companies available and, is not all-inclusive; nor do the tasks reflected on the list limit the bidder's ability to explore other opportunities to achieve U-WMBE participation.

Note: The subcontract goal is narrowly-tailored (per policy) to target underutilization of affected groups in specific trade/industry categories. Any WMBE/SLBE achievement that was not a variable in calculation of the narrowly-tailored goal is considered ancillary. Although ancillary participation is encouraged/expected, it cannot be credited toward meeting the narrowly-tailored goal, but it may count toward overall project participation when GFECP criteria for the underutilized group are met, or the U-WMBE goal is attained.

All other provisions of the Contract Documents and Specifications not in conflict with this Addendum shall remain in full force and effect. Questions are to be e-mailed to ContractAdministration@tampagov.net.

Jim Greiner

Jim Greiner, P.E. Contract Management Supervisor

STANDARDIZATION
CERTIFICATE OF CONDITIONS AND CIRCUMSTANCES

The purpose of this form is communicate the conditions and circumstances to standardize on a particular manufacturer of equipment.

Item/Equipment Required: Electromagnetic Flow meter

Name of Manufacturer: ABB

Conditions and circumstances for the single source, please be specific:
The Wastewater Department owns, operates and maintains several electromagnetic flow meters at pumping stations throughout our service area and at the treatment plant. Accurate and reliable flow information from these meters is critical for the proper monitoring and operation of our pumping stations and treatment plant.

After several years of using a variety of meter manufacturers for products and services, the Department has determined that ABB Electromagnetic flow meters are more reliable and easier to maintain than other brands. This is currently the only Electromagnetic flow meter that incorporates computer calibration traceability electronics. Standardizing to ABB Electromagnetic flow meters will provide reliability, manage and significantly reduce the required inventory of spare parts, improve calibration efforts and enable the Department to consult with a local representative for technical assistance.

OK **Requesting Department Director's Signature:** _____

Date of Request: 3/1/11

Requisition Number: _____ **Buyer Name:** _____

Purchasing Department Action: _____

Signature: _____

Date: 3-8-2011

STANDARDIZATION
CERTIFICATE OF CONDITIONS AND CIRCUMSTANCES

Instructions: The purpose of this form is to communicate the conditions and circumstances to standardize on a particular manufacturer of equipment

Item or Services Required: Graphic Touchscreen Human Machine Interface (HMI)

Name of Manufacturer: Maple Systems, Inc.

Conditions and circumstances for Standardization. Please be specific:

Maple System Graphic Touchscreen HMIs have been installed at the HFC Wastewater Treatment Plant and many of our regional pumping stations as an Operator interface for programmable logic controllers (PLC) and to provide an interactive graphic terminal for pumping station status and fault annunciation. The Maple HMI has proven to be rugged, reliable, and very user friendly. The Technicians and Operators are very familiar with the features of this product and in-kind replacement of existing HMIs will require no mechanical adjustments, reprogramming, or Operator training.

Standardizing on Maple System HMI will improve reliability, reduce required inventory of spare parts and reduce maintenance hours.

Requesting Department
Director's Signature:

Anthony Kasper, P.E., Director of Wastewater Department

Date of Request: 6/28/12

Requisition Number: Generic **Buyer Name:** _____

Purchasing Department Action: Approved

Signature: _____ **Date:** 6-28-2012

CITY OF TAMPA

Pam Iorio, Mayor

Wastewater Department

Howard F. Curren
Advanced Wastewater Treatment Plant

Date: 22 October 2010

To: Gregory Spearman, Director of Purchasing

From: Ralph Metcalf, Director of Wastewater

Subject: Conditions and Circumstances- Standardizing Dezurik Valves

The City of Tampa currently uses 257 motor/air operated plug and buried valves of various sizes in the Wastewater Treatment plant, and 549 in pump stations. The wastewater Department requests approval to standardize on Dezurik valves ranging in size from 4" up to 36". Standardizing will reduce our inventory and maintenance costs. In the past, uses of other brands have resulted in failures leading to sewage spills and we have had to replace other brands of valves with Dezurik valves.

Please review for your approval.

RLM

Approved
11-24-2010

STANDARDIZATION
CERTIFICATE OF CONDITIONS AND CIRCUMSTANCES

The purpose of this form is communicate the conditions and circumstances to standardize on a particular manufacturer of equipment.

Item/Equipment Required: Wastewater Centrifugal Pumps for Wet-pit/Drypit Applications

Name of Manufacturer: Fairbanks Morse Pumps

Conditions and circumstances for the single source, please be specific:
The Wastewater Department owns, operates and maintains over 220 wastewater pumping station throughout its service area. Each pump station is categorized as either a "submersible" station or "wet-pit/dry-pit" station and is equipped with 2 to 4 pumps depending on its size. To reduce costs and improve system reliability, the Department is standardizing its pumping equipment. This certificate is to standardize Fairbanks Morse Pumps for "wet-pit/dry-pit" stations.

After several years of using a wide variety of pump manufacturers for products and services, the Department has determined that Fairbanks Morse pumps are more reliable and easier to maintain than other brands for this type of pump. Standardizing to Fairbanks Morse Pumps will provide reliability, manage and significantly reduce the required inventory of spare parts, and enable the Department to consult with a local representative for technical assistance

Requesting Department Director's Signature: _____

Date of Request: 1/25/11

Requisition Number: _____ **Buyer Name:** _____

Purchasing Department Action: Approved

Signature: _____

Date: 1-26-2011

STANDARDIZATION
CERTIFICATE OF CONDITIONS AND CIRCUMSTANCES

Instructions: The purpose of this form is to communicate the conditions and circumstances to standardize on a particular manufacturer of equipment

Item or Services Required: Low Voltage Variable Frequency Drives

Name of Company considered Single Source: Yaskawa

Conditions and circumstances for the single source. Please be specific:

The City of Tampa Wastewater Department operates and maintains over 220 pumping stations and the Howard F. Curren Advanced Wastewater Treatment plant. In many of the pump stations and at many locations in the treatment plant, low voltage variable frequency drives (VFDs) are required to control electrical motors. These motors operate pumps, fans and blowers that are critical to pumping and treating wastewater.

Over the last 10 years, Yaskawa VFDs have proven to be the most reliable VFDs the Wastewater Department has used. The Department has used a wide variety of VFDs over the last 25 years. Yaskawa VFDs have required little or no maintenance.

Standardizing on Yaskawa VFDs will improve reliability, reduce required inventory of spare parts and reduce maintenance hours.

Requesting Department Director's Signature: Ralph L Metcalf II

Ralph L. Metcalf, P.E., Director of Wastewater Department

Date of Request: 4/1/10

Requisition Number: Generic **Buyer Name:** _____

Purchasing Department Action: Approved

Signature: _____ **Date:** 4-7-2010

STANDARDIZATION
CERTIFICATE OF CONDITIONS AND CIRCUMSTANCES

Instructions: The purpose of this form is to communicate the conditions and circumstances to standardize on a particular manufacturer of equipment

Item or Services Required: Programmable Logic Controller (PLC)

Name of Manufacturer: GE Intelligent Platforms, Inc. (formerly GE Fanuc Automation)

Conditions and circumstances for Standardization. Please be specific:

GE Intelligent Platforms PLCs have been installed at the HFC Wastewater Treatment Plant and our regional pumping stations to provide flexible control, data acquisition, data processing, and SCADA communications for a large variety of mechanical and hydraulic systems. The GE PLC is very robust, reliable, full featured, and user friendly. Due to the large installed base, our Technicians are very familiar with the hardware and programming software required to configure the GE PLC and its wide assortment of peripherals.

Standardizing on the GE PLC will improve reliability, reduce required inventory of spare parts and reduce maintenance hours.

Requesting Department
Director's Signature:

Anthony Kasper, P.E., Director of Wastewater Department

Date of Request: 6/28/12

Requisition Number: Generic **Buyer Name:** _____

Purchasing Department Action: Approved

Signature: _____ **Date:** 6-28-2012

SECTION 26 00 13

ELECTRICAL REQUIREMENTS FOR SHOP-ASSEMBLED EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Requirements for providing, installing and testing shop-assembled equipment as indicated, in accordance with the Contract Documents. Shop-assembled equipment panels and other items are specified under the driven equipment sections and may require external field connection to ancillary devices and other system components for interlocks and alarms. Provide all field wiring as required by the system and equipment specified under the driven equipment sections. This field wiring may not be specified or shown. This equipment includes but is not limited to the following:

1. Air compressors
2. Adjustable Frequency Drives (AFD's)
3. Standby Generator
4. Air monitoring equipment
5. Electric hoists and cranes
6. Miscellaneous control equipment
7. Odor control equipment
8. Pump and fan equipment
9. Sump pump equipment
10. Temperature control systems
11. Valve and gate operators

B. Related Work Specified in Other Sections, But is Not Limited to, the Following:

1. Section 4 - Concrete
2. Section 26 00 00 - Basic Electrical Materials and Methods
3. Section 26 05 19 – Wires and Cables
4. Section 26 05 33 – Electrical Raceway Systems
5. Section 26 27 19.19 - Electric Motors
6. Section 26 05 53 - Electrical Identification
7. Section 26 05 26 - Grounding

1.02 REFERENCES

A. Codes and standards referred to in this Section are:

1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)

2. UL 486A - Wire Connectors and Soldering Lugs for Use with Copper Conductors.

1.03 SYSTEM DESCRIPTION

A. Design Requirements: Provide the Shop Assembled equipment using the Components and Appurtenances meeting the requirements specified in Division 26.

1.04 SUBMITTALS

A. General: Furnish all submittals, including the following, as specified in the Specific/General Provisions.

B. Product Data and Information: Furnish manufacturer's data on all equipment and devices in the assembly, including voltages, number of phases, current ratings, capacities and other relevant data.

C. Shop Drawings: Furnish shop drawings for the shop-assembled equipment, including the following:

1. Layout drawings of the assembly showing accurately scaled basic equipment sections, auxiliary compartments and combination sections. Show special relationships of assemblies to associated equipment, including plan and front views of the equipment. Furnish a device summary.

2. Furnish wiring diagrams for assemblies that show connections to electrical power. Clearly differentiate between shop-installed portions of wiring and field installed portions.

3. Furnish construction drawings for equipment requiring field assembly. Clearly differentiate between shop-assembled portions and field assembled portions.

4. A manufacturer’s standard connection diagram or schematic showing more than one method of connection is not acceptable unless the intended method is clearly identified.

D. Quality Control: Furnish manufacturer's test reports and certified performance records of all equipment installed. Furnish field test reports after equipment is installed.

1.05 QUALITY ASSURANCE

A. Codes: Comply with local codes and all other applicable codes.

B. Regulatory Requirements: Comply with applicable Regulatory Agency requirements.

1.06 DELIVERY, STORAGE AND HANDLING

A. General: Deliver, store and handle all products and materials as specified in the Specific/General Provisions.

PART 2 PRODUCTS

2.01 FABRICATION

A. General: Provide shop-assembled equipment as standard products manufactured by companies regularly engaged in the manufacture of such equipment.

B. Factory Assembled Requirements: Provide control panels for shop-assembled equipment as complete factory assembled units that require only external connections for installation including main disconnect and all electrical features necessary for the proper operation of the units.

C. Controls:

1. Motors 1/2 Hp and Larger:

a. Provide motors suitable for 480-volt, 3-phase, 60-hertz operation, with all controls at 115 volts or less.

b. Provide a combination circuit breaker along with all required control transformers, relays, timers, heaters and other necessary incidentals to form a complete functioning unit.

c. Provide NEMA Size 1 or larger starters.

2. Motors less than 1/2 Hp:

a. Provide motors suitable for 120-volt, single phase operation.

b. Provide manual motor starter with neon pilot light.

3. Provide all controls and equipment as specified in Section16491.

D. Control Components: Install principal control components in NEMA 250 rated enclosures as follows:

AREA	ENCLOSURE
Above grade indoor	NEMA 12 - Industrial
Outdoor and below grade elevation indoor	NEMA 4X - Watertight and corrosion-resistant (stainless steel) (fiberglass-reinforced thermal setting polyester formulation) with stainless steel external hardware. Provide all external operators made of the same

AREA	ENCLOSURE
	materials as that of the enclosures
All areas listed Class I, Division 1 or 2, Group D as defined in Section 26 00 00 or as shown.	NEMA 7 - Explosion-proof

E. Miscellaneous Controls:

1. Provide float switches, pressure switches, limit switches, thermostats and other auxiliary control devices to satisfy the intended service.

2. Provide contacts rated at 10-amperes, 120 volts, 60-hertz ac, unless otherwise specified.

3. Provide limit switches that function in accordance with contact development charts.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Install shop-assembled equipment as indicated, in accordance with manufacturer's written instructions.

B. Coordination: Coordinate cabling and wiring as necessary to interface installation of shop-assembled equipment.

C. Torque Requirements: Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torque requirements are not indicated, tighten connectors and terminals in accordance with UL Standard 486A.

D. Grounding Connections: Make equipment grounding connections for the shop-assembled equipment as specified and shown. Tighten connections in accordance with UL Standard 486A to assure permanent and effective grounding.

E. Adjustments: Make all necessary adjustments to the equipment to provide complete and satisfactory operation upon completion of the Contract.

END OF SECTION

SECTION 22 00 00 – PLUMBING GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General Provisions, Supplementary General Provisions and of Section 22 00 00 shall apply to the Plumbing work shown on the drawings and specified under this Division 22.

B. Examine other Sections of the Specifications and Contract Documents for work that may affect or is related to the work of this Division 22 whether or not such work is specifically mentioned in this Section.

C. Coordinate work specified herein with that of other trades affecting or affected by work of this Division 22. Cooperate with those trades to assure steady progress of work under contract. Promptly notify Project Superintendent of any issues that may affect the work under this Division 22.

1.02 SCOPE OF WORK

A. Provide the labor, materials and equipment for the installation and testing of the plumbing systems shown on the drawings and herein specified.

B. All systems shall be complete, tested and ready for operation at time of Substantial Completion. Refer to Specifications General Provisions and Sections 22 01 00 and 22 02 00.

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

22 02 00 Operation and Maintenance Manuals
22 08 00 Painting and Identification
22 10 00 Plumbing – General
22 20 00 Piping General
22 21 00 Piping

1.04 RELATED WORK NOT INCLUDED IN THIS DIVISION

A. Refer to related Sections of the Contract Documents for work to be provided by others such as but not limited to:

Finish Painting
Electrical Work - Refer to Division 26
Equipment foundations: Masonry, concrete or structural steel
Access doors
Flashing, but counter flashing shall be included herein
Cutting and patching

1.05 DEFINITIONS

A. Specific items of terminology, as used herein, shall have the following meanings:

1. BY OTHER TRADES: Shall mean work that is to be provided by persons or

parties responsible for work at the project other than the party or parties who have been awarded a contract for work under this Division 22. In the event that this document is used to acquire work as part of a general construction contract, the words "by other trades" shall mean by persons or parties who are not anticipated to be the installers for the work shown under this Division 22. In this context, the words "by other trades" shall not be interpreted to mean, “not included” in the overall contract.

2. CONCEALED: Shall mean work is embedded in masonry or other construction, installed behind walls, above ceilings, in crawl and attic spaces or shafts.

3. DEMOLITION: Shall mean the removal of any existing equipment, piping, ducts, etc. and the temporary or permanent capping or plugging of indicated existing services.

4. EXPOSED: Shall mean work that is not concealed.

5. FURNISH: Shall mean purchase and deliver to the project site indicated equipment and/or materials complete with necessary rigging, appurtenance and supports.

6. INSTALL: Shall mean unload equipment and materials at site delivery point; store in a dry safe protected location at site and perform every operation necessary to establish secure mounting and correct operation at proper location in the project. Include necessary connections to required services.

7. PIPING: Shall mean pipe, fittings, flanges, valves, controls, hangers, traps, drains, insulation, vents, and any other items customarily required in connection with the installation of systems for the transfer of fluids. Include the tests and the test and balance of such systems.

8. PROVIDE: Shall mean FURNISH and INSTALL.

9. WORK: Shall mean to include all materials, labor, equipment, tests and test and balance required for a complete and operable installation.

10. CONTRACTOR / INSTALLER: Shall mean the licensed plumbing contractor responsible for providing the work under this Division 22.

B. Except where modified by specific notation to the contrary, it shall be understood that the indication and/or description of any item, in drawings or specifications or both, carries with it the instruction to furnish and install item, regardless of whether or not this instruction is explicitly stated as part of indication or description.

1.06 QUALITY ASSURANCE

A. General

1. It is the intent of the drawings and specifications to obtain a complete and operable installation. Refer to Specifications General Provisions.

2. All work shall comply with applicable Codes and Standards at the time the project is bid including the requirements of the State and local Board of Health.

3. All materials shall be new, properly labeled and/or identified, and in full compliance with the contract documents and applicable Codes and Standards.

4. The quality and weight of the materials furnished and installed in this project shall comply with the requirements and specifications of the appropriate standards of the American Society for Testing and Materials (ASTM).

5. Manufacturer's model names and numbers used in this Division 22 are subject to change per manufacturer's action. Contractor shall therefore verify applicable information with manufacturer's representative before ordering any product or equipment. Notify Architect / Engineer of any changes and promptly furnish, for their review, information on new or replacement product. Changes shall be at no cost to the contract.

B. Installer's Qualifications

1. Installers performing work under this Division 22 shall be both a State and local licensed firm regularly engaged in providing the work specified under these sections. Provide copy of license upon request.

2. Installer shall provide, upon request, a list of at least five similar jobs he has completed in the last two (2) years.

C. Drawings and Specifications

1. Drawings are diagrammatic but shall be followed as closely as actual construction of the building and the work of other trades will permit.

2. The specifications and drawings are complementary and are to be taken together for a complete interpretation of the work. Notes or details on drawings which refer to an individual element of work and that may conflict with the specifications shall be brought up to the attention of the Architect / Engineer for clarification before any equipment or materials are purchased or work is installed. Failure to follow these guidelines may cause the contractor to replace / correct the work at no cost to the contract.

3. The separate divisional drawings and specifications do not relieve the contractor from the responsibility to provide the work, which is indicated on any of the drawings or division of the specifications.

4. The drawings of necessity utilize notes, details, symbols and schematic diagrams to indicate various items of work. Therefore, no interpretation shall be made from the limitations of such notes, details, symbols and diagrams that any elements of work necessary for a complete installation are excluded. Any discrepancies shall be brought to the attention of the Architect / Engineer for clarification before bid time and the purchasing and installation of any equipment or materials. No work shall proceed until issues are resolved. Failure to follow these guidelines may cause the contractor to replace/correct the work at no cost to the contract.

5. Details, sections and enlarged plans that appear on the drawings are intended only for the purpose of establishing general feasibility. They do not supersede field coordination of the indicated work among the various trades working in that area.

6. Examine and coordinate site provisions with civil engineering documents. Examine and coordinate building provisions with the architectural, structural, electrical, mechanical and fire protection drawings and specifications prior to

submitting bid. Any discrepancies shall be brought up to the attention of the Architect / Engineer.

7. Architectural and structural drawings take precedence over and plumbing drawings with reference to building construction. Any discrepancies shall be brought up to the attention of the Architect / Engineer.

8. Architectural drawings take precedence over plumbing drawings with reference to the location, type and number of plumbing fixtures, cabinets and any other similar fixed items. Any discrepancies shall be brought up to the attention of the Architect / Engineer.

9. The Architect shall be notified of any discrepancies, omissions, conflicts or interferences, which occur between drawings and specifications. If such notification is received in adequate time prior to bid time additional data or clarifications will be issued by addendum to all bidders. Failure to follow these guidelines may cause the contractor to replace/correct the work at no cost to the contract. See note 4 above.

10. When extra work involving Division 22 trades is authorized, the work as shown on drawings, sketches, described by Addendum or Change Order is subject to this specification in all respects.

D. Standards

1. Certain materials and installation procedures are described by reference to industry standards published by nationally recognized organizations such as, but not limited to, those listed below:

Hydraulics Institute Standards
American Society for Testing Materials (ASTM)
American Society for Mechanical Engineers (ASME) Code of Unfired Pressure Vessels
National Fire Protection Association (NFPA)
National Electrical Manufacturers Association (NEMA)
Underwriter's Laboratories (UL)
American National Standards Institute (ANSI)
American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)

2. Additional standards may be listed in other Sections of the Specifications and in the Florida Building Code 2017.

3. Whenever a reference is made to a standard, installation and materials shall comply with the latest adopted and published edition of the Standard at the time project is bid.

E. Requirements of Government Agencies

1. The work under this contract shall comply with the standards and requirements of City of Tampa Fire Department and City of Tampa.

2. The contractor, at no cost to the contract, shall correct any work found to be in noncompliance with those Standards.

1.07 PERMITS, FEES AND INSPECTIONS

A. Contractor shall give the necessary notices, obtain all permits and pay all government fees, sales taxes and other costs, including utility connections or extensions, in connection with this work. The City will submit the plans for CSD permitting.

B. Obtain all required certificates of inspection for work and deliver them to the Architect / Engineer before requesting acceptance and final payment for the work.

1.08 CODES

A. All work specified and installed under Division 22 shall comply with the Forida Building Code (FBC) 6th Edition 2017 and Chapter 5 of the City of Tampa Code..

B. pplicable codes shall be those adopted by the authority having jurisdiction at the time project is bid.

C. Installer's of work specified under Division 22 shall include in the work, without extra cost to the contract the labor, materials, services, apparatus and drawings required to comply with applicable laws, ordinances, rules and regulations before submitting his bid.

E. Installer shall inform the Architect / Engineer of any work or materials which conflict with any of the applicable codes, standards, laws and regulations before submitting his bid.

1.09 FIELD CHANGES DURING CONSTRUCTION

A. Occasionally during construction changes that deviate from the approved permit documents may occur.

B. Local authorities may require that the changes be submitted for their review via signed and sealed documents indicating the design professional concurrence with said changes. Contractor shall therefore notify the design professional of any changes before proceeding with the work and provide justification for the change including supporting sketches detailing the extent and nature of the change.

C. Failure to follow this procedure may delay the design professional response until the need for the change is justified.

D. When changes are made for the contractor's sole convenience, contractor assumes full responsibility for reimbursing the design professionals for his / her time and other expenses. This includes changes caused by lack of coordination between installing contractors working in a common area.

PART 2 - MATERIALS

2.01 GENERAL

A. Materials or products specified herein and/or indicated on drawings by trade name, manufacturer's name and/or catalog number represent a standard of quality or performance on which the design of this project is based.

B. Since manufacturers reserve the right to change, at anytime, the design and quality of their products, installers shall verify such information to assure that the equipment and materials being submitted are in compliance with the intent of the drawings and specifications. Shop drawings shall clearly note such changes. Any required changes shall be made at no cost to the contract.

C. A list of all materials and equipment, which the installer proposes to furnish, shall be submitted for approval within then (10) days after the contract has been awarded. Data shall be complete in all respects.

2.02 ACCESS DOORS AND/OR PANELS

A. Access doors or panels are required for access to service valves, electrical disconnects and other Division 22 equipment concealed in or behind walls, above ceilings, other than lay-in tile, and where it may be necessary for the test and service of equipment.

B. Access doors and panels shall conform to the finish of adjacent construction as indicated on the Architectural construction documents. Access doors/panels shall be as specified in another section of the specifications and be provided by the contractor for general construction.

C. Access doors or panels installed in fire rated assemblies shall meet all the requirements of the assembly.

D. Each installer providing work under this Division of the specifications shall be responsible for determining the size of each door/panel required for access to his work. Dimensions shall be determined in the field prior to ordering doors or panels.

E. All doors and panels shall be of the hinged type with easy to open locking devices. Provide locks when security or fire rated considerations so require and as directed by Owner and Architect / Engineer.

F. Submit shop drawings for review by Architect / Engineer.

2.03 FIRE STOPPING

A. Unless otherwise noted on drawings; modified by Architect and/or authorities having jurisdiction, the following materials may be used to seal penetrations of fire rated assembly by work installed under this Division 22.

1. Rock wool: Minimum four pounds for cubic foot density; flame spread 15, smoke developed 0, fuel distribution 0 by ASTM E84; minimum melting point 2000ºF.

2. Concrete and masonry are also approved firestop materials by NFPA 90A.

3. UL approved products such as Dow-Corning and 3M.

B. When using any of these products, UL, NFPA and manufacturer's recommendations shall be followed.

PART 3 - EXECUTION

3.01 ORGANIZATION OF THE WORK

A. At all times, a competent superintendent shall be on site in charge of the work. Replace if performance is unsatisfactory to the Owner and/or Architect / Engineer.

B. Maintain a complete file of all contract and shop drawings at the site available for review by Owner's representatives and Architect / Engineer. A set of drawings shall be dedicated as the “As Built Record Set” where all changes and / or deviations from the

contract documents are noted as they occur. Refer to Specifications General Provisions and Section 22 01 00.

C. Upon installation of equipment, shop drawings shall be initialed and dated. This procedure will ensure proper scheduling and allow Owner's representatives and Architect / Engineer to check the work in progress.

3.02 COORDINATION WITH OTHER TRADES

A. Coordinate work to be installed under this Division 22 with other trades and existing field provisions to avoid interferences and delays. Assist in working out space requirements to make a satisfactory installation. Notify the Engineer of any major conflicts that cannot be resolved through normal field coordination with other trades.

B. When work by others is installed before it is coordinated with the work of Division 22 trades, and as a result interferes with the Division 22 work, the installer responsible for causing the conflict shall make the necessary changes in his work to correct the condition at no cost to the contract. Notify Architect / Engineer of such conflicts. Contractor is responsible for reimbursing the Architect / Engineer for his time and cost in assisting in the resolution of such issues.

C. Furnish to other trades all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

D. All work outside buildings shall be coordinated with site utilities contractor. Verify grade and invert elevations before proceeding with any work.

E. Local authorities may require that field changes that deviate from the contract documents be submitted for their review via signed and sealed documents that indicate design professional concurrence with said changes. Contractor shall notify the design professional of such changes before proceeding with work and provide justification for the change. Failure to follow this procedure will make the contractor responsible for all costs associated with the change including design professional's time and other expenses. This includes changes caused by lack of coordination between installing contractors working in a common area.

3.03 EXCAVATION AND BACKFILL

A. Provide the excavation and backfill necessary for the installation of the underground piping work specified under this Section and shown on the plans. Include work incidental to excavation such as cutting, shoring, pumping, sheeting, piling, etc.

B. Before proceeding with excavation, review civil engineering and site survey drawings for location of utilities, grades, invert elevations and any other information in the area affected by the work under this section. Comply with State and Local environmental regulations and protect surrounding areas.

C. All excavation shall be unclassified and shall include the removal of all materials encountered. Cutting and removal of concrete slabs is included.

D. Trenches shall be of sufficient depth to allow adequate cover over piping. Provide minimum of two feet (2') cover under non-traffic areas and three feet (3') cover under traffic areas.

E. When minimum cover under traffic areas cannot be maintained, pipes must be encased in concrete.

F. In traffic areas that are under the jurisdiction of a city, county or state, excavation and backfill shall be done to their standards. Obtain required permits, pay fees and coordinate inspections by authorities having jurisdiction.

G. Bottoms of trenches shall be instrument graded in direction of flow. Pipes shall have solid bearing on undisturbed earth. Concrete or other approved supports shall be provided for all piping installed in filled ground.

H. Where trenches run under building footings or come within a 2 to 1 slope from the bottom of such footings, backfill with a lean concrete mix to a point at or above the bottom of such footing. Review with and obtain approval of project Structural Engineer before proceeding with work.

I. Where trenches must be excavated in rock, a 6" layer of crushed stone or gravel shall be placed in trench to support pipes. Trenches shall be of sufficient depth to install cushioning layer.

J. Backfill shall be made with clean earth free of rocks, debris or other foreign material. Deposit backfill in uniform layers not over 6" thick. Tamp each layer before applying next one. Cinders in backfill in any amount are prohibited. Complete backfill shall conform to surrounding ground and finish grade.

K. Excavated materials remaining after the backfilling operation is completed shall be either deposited on the site or removed by the contractor as directed by the Architect.

L. Repair all streets, sidewalks, pavements, lawns, curbs and other finished surfaces damaged by excavation and restore to original condition and to the Owner’s satisfaction.

3.04 ACCESS DOORS AND/OR PANELS

A. Each installer shall be responsible for coordinating with the project superintendent the number, size and location of the access doors/panels required by his work. When field provisions allow it, one single, larger door/panel shall be used when several items furnished by different trades are located in the same area.

B. Doors/panels that are found to be of inadequate size to allow proper removal, access to service equipment and other concealed devices shall be replaced with larger doors/panels at no cost to the contract.

C. Doors/panels that are found to be improperly located with relation to the equipment or concealed devices they serve, shall be relocated at no cost to the contract. Climbing above ceilings to reach concealed devices or equipment is not an acceptable option.

3.05 FIRE STOPPING

A. Pipe penetrations of fire rated walls and/or floors shall be sealed to maintain integrity of construction and prevent the passage of flame and hot gases.

B. All products, materials and methods of installation shall be UL labeled and approved and meet NFPA 251 requirements.

C. Fire rated construction assemblies are specified under Architectural Section of the Contract Documents.

3.06 CUTTING AND PATCHING

A. The cutting and patching of walls, partitions, ceilings and floors necessary for reception of work indicated in this Section of the contract documents or caused by the installer's failure to provide or properly locate sleeves, forms and inserts, or caused by incorrect location of the work shall be the installer's responsibility.

B. When it becomes necessary to cut finished materials, submit for the Architect approval, drawings showing the work required and obtain approval before doing such cutting.

C. Chases and openings in walls/roofs and floors may be provided under the work of other sections. Furnish exact dimensions and locations of these openings to suit the apparatus to be used before such walls are built.

D. No structural members shall be cut without the previous written approval of the Structural Engineer and the Architect.

3.07 SEQUENCING AND SCHEDULING OF WORK

A. All work to be performed under this contract shall be carried out in accordance with an approved construction sequence and schedule.

3.08 STORAGE OF EQUIPMENT AND MATERIALS

A. All equipment and materials stored on site shall be located in a dry location where they are properly protected from the weather, injury or deterioration. Materials shall not be stored in contact with the ground or floor.

B. Do not remove manufacturer's packing materials until ready to install.

C. Materials showing signs of corrosion or damage due to improper handling or storage shall be replaced at no cost to the contract.

D. Provide continuous protection for all equipment and materials already installed.

3.09 WATERPROOFING

A. Where any work pierces waterproofing including waterproof concrete, the method of installation shall be as approved by the Architect before work is done.

B. Provide all necessary sleeves, caulking and flashing required to make openings absolutely watertight. Waterproof flashing materials shall be compatible with base materials.

3.10 TESTS

A. Include all tests specified and/or required under applicable codes, laws, rules and regulations. Additional tests shall also be performed as indicated herein and other sections of the specifications.

B. Notify the Architect / Engineer at least 72 hours in advance of all tests. Furnish all necessary instruments, gauges and other equipment required for tests. Make preliminary tests prior to giving notice of final tests.

C. All parts of the work and associated equipment shall be tested and adjusted to work properly and be left in perfect operating condition.

D. Correct defects disclosed by these tests without any additional cost to the Owner. Repeat tests on repaired or replaced work.

E. Maintain a log of all tests being conducted and have it available for review by the Architect / Engineer. Log to indicate date, type of tests, duration, and defects noted and when corrected.

3.11 EQUIPMENT SERVICE

A. Provide clearances around equipment as required by Code, owner standards and equipment manufacturer for the proper maintenance or removal of equipment. Most stringent requirements shall apply.

B. Coordinate with other trades so no conduit, pipes, ceiling hangers and / or other equipment, etc. interfere with the required clearances.

C. Notify project superintendent when work by other trades needs to be relocated in order to maintain required clearances. Notify Architect / Engineer if provisions persist and are not corrected by the responsible trade.

END OF SECTION – 22 00 00

SECTION 22 02 00 – OPERATION AND MAINTENANCE MANUALS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General Provisions, Supplementary General Conditions General Provisions and Section 22 00 00 are part of this Section.

B. Examine other Sections of the Specifications for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of work under the contract.

1.02 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

22 00 00 Plumbing General Requirements
22 08 00 Painting and Identification
22 10 00 Plumbing – General
22 20 00 Piping General
22 21 00 Piping

B. The Operation and Maintenance Manuals shall be prepared in accordance with ASHRAE Guideline 4 - latest edition, specified herein and in General Provisions.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

3.01 OPERATION AND MAINTENANCE (O&M) DOCUMENTATION PACKAGE

A. The complete O&M documentation package shall be submitted to the Architect / Engineer prior to the request for final completion acceptance of the project. Information shall be in 3-ring binders, properly indexed and labeled and electronic pdf.. Three (3) sets are required.

B. The O&M documentation package shall include but not be limited to the following:

1. O&M Documentation Directory(s).

2. Emergency Service Information(s).

3. Operating manual(s). Clearly note the model numbers and serial numbers of the installed equipment.

4. Maintenance Manual(s). Clearly note the model numbers and serial numbers of the installed equipment on all technical data, parts lists, etc.

5. Test reports, including but not limited to Health Department Water Tests;

Hydrostatic and Pneumatic Plumbing Tests, Pressure Test of Piping and others listed in the contract documents.

6. Construction as-built record documents as per Specifications General Provisions and Section 220100.

3.02 O&M DOCUMENTATION DIRECTORY

A. The Documentation Directory shall include the list of documents contained in the O&M manual, a list of equipment and the equipment's identifying tag.

3.03 EMERGENCY SERVICE INFORMATION

A. The emergency service information section of the O&M manual shall include an equipment list and the name of the local companies providing emergency repair service.

B. List addresses, telephone numbers, and contact person of all companies listed in this section of the O&M manual.

3.04 OPERATIONS MANUALS

A. The operations manual section of the O&M manual shall contain all relevant information required for the day-to-day operation of the building system(s) and equipment. Clearly note the model numbers and serial numbers of the installed equipment.

B. The operations manual section shall be divided into two sub-sections. The first sub-section shall contain general system information and the second shall contain technical information required for the building operator.

3.05 MAINTENANCE MANUAL

A. The maintenance manual section of the O&M manual shall contain all relevant information required to properly maintain the building system(s) and equipment. Clearly note the model numbers and serial numbers of the installed equipment.

B. The maintenance manual shall be divided into two sub-sections. The first sub-section shall contain a complete equipment inventory and the second shall contain the maintenance procedures for the equipment.

C. The maintenance procedures section shall contain, as a minimum, the following information:

1. Description (specification) of each piece of equipment. This should consist of easily read drawings accompanied by a clear description of each component.

2. Description of function, as applicable: the function of equipment, procedures before start-up, functional part loads, and performance verification procedures.

3. Recommended maintenance procedures and their recommended frequency for site-specific application.

4. Recommended list of spare parts, part numbers, and the location from which they can be obtained.

5. Original purchase order number; date of purchase; name, address and phone

number of the vendor.

6. Warranty information.

7. Installation information.

8. Any other information needed for the preparation of documents supporting the management of operation and maintenance programs.

3.06 TEST REPORTS

A. The O&M manual shall contain copies of the water (pipe) pressure tests. For Plumbing Systems provide copies of bacteriological and other health / safety test required by Code, utilities and other Authorities.

3.07 RECORD DOCUMENTS

A. Provide one hard copy of as-built record documents. As-built record documents shall contain complete updated equipment schedules for the equipment actually installed.

B. In addition, provide CAD drawing files of the as-built record documents. Contact the Architect / Engineer to verify delivery media.

C. All documents shall with the requirements of General Provisions of the Specifications.

END OF SECTION – 22 02 00

SECTION 22 08 00 – PAINTING AND IDENTIFICATION

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General Conditions, Supplementary General Conditions General Provisions and Section 22000 are part of this Section.

B. Examine other Sections of the Specifications for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of work under the contract.

1.02 SCOPE OF WORK

A. All piping and equipment provided under Division 22, which is exposed to view, to the weather and/or as indicated on the drawings and specifications shall be painted unless otherwise noted.

B. All galvanized metals that are to be field painted shall be properly prepared to accept specified paint. If paint peels, retreat and repaint at no cost to the contract.

C. All piping and equipment shall be labeled and/or identified as herein specified.

D. Field finish painting may be specified in another section of the Specifications. This installer shall leave his work clean and free from oil, dirt and grease. Apply primer ready to field painting, where required.

E. All unfinished ironwork installed under Division 22, which is exposed to view within the building or exposed to the weather, shall be painted as herein specified.

F. Provide permanent identification on equipment and piping systems. Coordinate with City of Tampa Wastewater Department the numbering sequence of equipment. City of Tampa Standards take precedence over these specifications.

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

22 00 00 Plumbing General Requirements
22 02 00 Operations and Maintenance Manuals
22 10 00 Plumbing
22 20 00 Piping General
22 21 00 Piping

B. Refer to Division 09 – Finishes of the Specifications for additional information regarding paints, finishes, preparation, etc.

1.04 SHOP DRAWINGS

A. Submit catalog data, color samples, and other requested data for following in accordance with the requirements of General Provisions and Section 22 00 00 of the Specifications.

1. Paints
2. Treatment of galvanized metals
3. Markers
4. Labels

PART 2 - PRODUCTS

2.01 PAINT

A. Rust inhibitor paint shall be red chromate base made up in a synthetic resin vehicle.

B. Finish paint where specified shall meet the requirements of the Paint Section of the Specifications.

2.02 PAINT SCHEDULE

A. Painting schedule for equipment and piping:

Equipment and system components	Factory applied manufacturer's standard color and finish.

2.03 PIPING IDENTIFICATION

A. All plumbing piping, insulated and uninsulated shall be identified as herein specified.

B. Identify piping systems by either stenciling the name of the service or applying plastic pipe markers similar to Set Mark as manufactured by Seton.

C. Arrows indicating direction of flow shall be shown next to the pipe identification name.

D. ANSI Standards recommend that the size of the identification letters and the length of the color field be as follows:

Outside Diameter Of Pipe or Covering (in.)	Length of Color Field (in.)	Size of Letters (in.)
3/4 to 1-1/4 (19 to 32 mm)	8 (200 mm)	1/2 (13 mm)
1-1/2 to 2 (28 to 51 mm)	8 (200 mm)	3/4 (19 mm)

E. Install markings after painting or insulation of pipes has been completed.

PART 3 - EXECUTION

3.01 GENERAL

A. Ironwork installed under this Division of the Specifications exposed to view within the building, and not otherwise specified to be galvanized, stainless steel, copper or chrome plated, such as pipes, pipe hangers, structural supports, supports for equipment, black iron partitions or casings, tanks, etc., shall be painted with one (1) coat of rust inhibiting paint. Finish paint may be specified in another section of the contract documents, color as selected by Owner.

B. Ironwork installed under this Division of the Specifications which is exposed to the weather, and not otherwise specified to be galvanized, stainless steel, copper or chrome plated, such as pipe supports, vent pipes, etc., shall be painted with two (2) coats of rust inhibiting paint and one (1) coat of an acrylic base UV and mold resistant white paint. The Owner or the Architect / Engineer may select a different color of the finish paint.

C. All field finish painting to be as directed by the Architect and specified in another section of these specifications.

D. Painted galvanized metals from which paint peels shall be stripped, retreated and repainted at no cost to the contract.

3.02 PIPE AND VALVE IDENTIFICATION

A. On exposed piping apply identification lettering and flow arrows on 30-foot centers of straight runs, at valve locations, at points where piping enters and leaves a partition, wall or ceiling.

B. On concealed piping installed above non-removable ceilings apply markers on pipes near a valve or other devices that can be reached by means of access doors or panels. Identification markings shall be clearly visible from access doors and/or panels.

C. On concealed pipes installed above removable ceilings apply markers in the manner described for exposed piping.

D. Apply markers at exit and entrance point to each vessel, tank or piece of equipment.

E. Provide approved ceiling tile markers in areas with removable ceiling to indicate location of valves and/or other devices, concealed above ceiling.

3.03 EQUIPMENT IDENTIFICATION

A. Identify each piece of equipment by its system number and other appropriate designation by stenciling in letters of approved size and wording. Equipment requiring identification shall include but not limited to: plumbing equipment, control cabinets, starters and power disconnects, and others as directed by Architect / Engineer.

B. Identification numbers and names shown on the contract documents are for reference only. They shall be changed to meet owner's numbering sequence and standards. Contractor shall request a copy of such standards before proceeding with work under this Section.

C. Contractor shall mark record construction documents to reflect the labeling and numbering sequences when different from contract documents.

3.04 CONCEALED EQUIPMENT IDENTIFICATION

A. Provide approved ceiling tile markers in areas with removable ceilings to indicate location of valves and/or other devices, concealed above ceiling.

END OF SECTION – 22 08 00

SECTION 22 10 00 – PLUMBING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General Provisions, Supplementary General Provisions General Provisions and Section 22 00 00 shall apply to the Plumbing work shown on the drawings and specified under this Section of the specifications.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work specified herein with that of other trades affecting or affected by work of this Division 22. Cooperate with those trades to assure the steady progress of work under contract. Promptly notify Project Superintendent of any issues that may affect the work under this Division 22.

1.02 SCOPE

A. Provide plumbing system(s) as shown on drawings and listed herein. Include all accessories required for a fully functional, safe and complete installation ready for use.

B. Provide following plumbing system:

1. Storm water system including roof drains, area drains, and others as shown. Make final connection to site storm water system five feet (5') outside building or as shown on drawings. Coordinate work outside building with Civil Engineering Site Utility Plans and Site Utilities Contractor.

2. Sanitary sewer system waste and vent lines including connection to all fixtures. Make final connection to site sanitary sewer system five feet (5') outside building or as shown on drawings. Coordinate work outside building with Civil Engineering Site Utility Plans.

3. Domestic cold-water supply including connection to all fixtures and other systems or equipment indicated on contract documents. Make final connection to site water main ± five feet (5') outside building or as shown on drawings. Coordinate work outside building with Civil Engineering Site Utility Plans and Site Utilities Contractor.

4. Domestic electric hot water heaters and piped hot water supply to indicated fixtures. Include mixing valves or dedicated water heaters to supply different water temperatures as shown in the contract documents.

5. Plumbing fixtures as scheduled. Refer to Architectural plans for final number, type and location of fixtures.

6. Oil and sand interceptor including all indicated piping and floor drains. Make final connection to building sanitary disposal system.

7. Provide kitchen grease waste collection system. Provide grease trap or interceptor as indicated on contract documents.
8. Provide electric tank/heater system with recirculating pumps.

9. Provide vacuum breakers and backflow prevention devices as required by code for any system or equipment installed under this Division 22 of the Specifications that is directly connected to a potable water supply. Coordinate with other trades.

10. Provide water hammer arrestors to protect hot and cold-water piping systems.

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

22 02 00 Operations and Maintenance Manuals
22 08 00 Painting and Identification
22 20 00 Piping General
22 21 00 Piping

1.04 CODES AND STANDARDS

A. 2017 Florida Building Code, Plumbing.

B. Design and installation standards:

Hydraulics Institute Standards
Florida Accessibility Code 2012

C. For additional codes and standards, refer to Specifications Section 22 00 00.

1.05 QUALITY ASSURANCE

A. The quality and weight of the materials furnished and installed in this project shall comply with the requirements and specifications of the appropriate standards of the American Society for Testing and Materials (ASTM) and the latest requirements of the Florida State Board of Health Sanitary Code.

B. To the extend possible, American made products shall be used.

C. For additional Quality Assurance requirements refer to Specifications General Provisions and Section 22 00 00.

1.06 SUBMITTAL DATA

A. Submit catalog data and/or shop drawings for the following items specified herein and shown on the contract documents.

Plumbing fixtures and accessories.
Electric water coolers.
Floor drains.
Cleanouts.
Hose bibbs.
Manufacturer's guarantees / warranties for electric water coolers and heaters.
Pipe Clamps.
Vacuum breakers.
Backflow preventors.
Grease interceptor.
Sand / oil interceptor.
Water hammer arrestors.

B. For additional submission requirements refer to Section 22 00 00

PART 2 - PRODUCTS

2.01 GENERAL

A. Pipes, fittings, valves, hangers, supports and installations procedures shall be provided as herein specified.

B. All materials shall be new, of quality as specified and when required be clearly labeled and/or stamped.

2.02 PIPING

A. Materials for following piping systems are specified under Specifications Sections 22 20 00, Piping General and 22 21 00, Piping.

1. Domestic hot and cold water.

2. Sanitary (soil, waste and vent).

2.03 INSULATION

A. Insulate all piping below ADA compliant lavatories and sinks including P-traps with Handi Lav-Guard Insulation Kit No. 102 made by Truebro Co. or McGuire Pro-Wrap. Velcro and twist tie joints are not acceptable. Refer to Architectural Drawings for location of ADA compliant fixtures.

2.04 PLUMBING FIXTURES

A. Provide plumbing fixtures as scheduled on the drawings. Equip each fixture with a water-sealing trap. Install a tight-fitting chromium plated escutcheon plate at each pipe penetration through cabinet walls, floors, walls and ceilings. Escutcheon shall completely seal opening around pipe.

B. Each individual fixture and piece of equipment shall have a shutoff valve in each water supply, which shall permit each fixture and piece of equipment to be shut off without interfering with the water supply of other fixtures or equipment.

C. Contractor shall verify location, type, number and installation of plumbing fixtures as shown on the latest Architectural Drawings issued at bid time including all addendums. Architectural drawings take precedence over plumbing documents. Notify Architect / Engineer of any noted differences.

D. Contractor to verify clearances needed for fixtures being installed in casework, to ensure a proper installation and service clearances. Notify Architect / Engineer of any conflicts.

E. After wall hung plumbing fixtures are set, the space between the fixture and the wall shall be sealed. Use Tub-Tite caulk as manufactured by American Fluoresite Co., or approved equal. Seal shall not retain water, dirt etc.

F. Fixtures shall be protected from damage during construction, and shall be thoroughly cleaned prior to final acceptance.

G. Porcelain or vitreous china fixtures shall be clean, smooth and bright. They shall be warranted not to craze, discolor or scale.

H. Fittings and piping shall be brass and when exposed, shall be polished chrome-plated. Protect against damage from cleaning fluids used by tile setter.

I. Replace fixtures and piping damaged during construction.

J. Acceptable manufacturers are:

1. Plumbing Fixtures (water closets, lavatories, urinals): American Standard, Briggs, Eljer, Gerber, Kohler, Sloan or Toto.

2. Faucets: Delta, Gerber and T&S Brass.

3. Flush Valves (water closet and urinal): Delaney, Hydrotek, Sloan, Toto or Zurn-Aqua Flush. Flush valves shall be listed by plumbing fixture manufacturer as being compatible with their product.

4. Security / Specialty fixtures: Acorn, Bradley and Encon

5. Showers: Delta, Lawler, Powers or Symmons.

6. Sinks – Stainless Steel: Elkay

7. Water Coolers: Elkay, Halsey or Taylor

8. Mop Sinks: Fiat

9. Water Heaters: A. O. Smith, Lockinvar, Rheem, Rudd, State

10. In all cases, listed manufacturers must provide proof that their product is equal or better than the Basis of Design.

K. Plumbing fixtures and water supply devices shall be of the water saving type as required by the State of Florida Model Energy Conservation Code 2010. Flow restrictor devices shall be factory installed. Submit information with shop drawings.

L. All wall-mounted fixtures shall be provided with floor-mounted carriers. Carriers for lavatories shall have concealed arms. Verify adequacy of wall or chase space with project superintendent before installing carriers. Notify Architect / Engineer of any conflicts.

M. New toilets to be floor-mounted elongated bowl low water consumption fixture. Toilets to meet or exceed ASME A112.19.2M and 19.6M specifications for vitreous china fixtures. This includes flush performance, ball pass diameter, trap seal depth and all dimensions. The fixtures must be American made in order to fully meet these specifications.

N. When scheduled and indicated on plans, provide electrically actuated hands free flush valves and faucets complete with sensors. Coordinate power requirements with Division 26 installer.

2.05 FLOOR DRAINS

A. Provide floor drains as scheduled and at locations shown on the drawings.

B. Provide floor drains in all toilet rooms.

C. Provide trap primer connection on all floor drains and/or hub drains.

D. Provide flashing clamp devices where required by floor construction.

E. Acceptable floor drain manufacturers are: Josam, J. R. Smith, Zurn or Wade.

2.06 TRAP PRIMERS

A. In restrooms, trap primers shall be connected to nearest lavatory / sink P-trap waste pipe. Traps equal to J.R. Smith No. 2698

B. When a waste pipe trap primer cannot be used, install Precision Products Inc. or equal trap primers.

2.07 HOSE BIBBS

A. Provide hose bibbs at locations indicated on contract documents. Hose bibbs shall be brass construction, with brass or chrome plated finish as required by location or as indicated on contract documents.

B. Unless otherwise noted on contract documents, hose bibbs shall be 3/4-inch size, hose end and with vacuum breaker - backflow preventor attachment and loose key feature.

C. For outdoor applications, hose bibbs shall be in a box with lockable door similar to Woodford Model B24 or Freezeless Model 14 Series as required by local weather provisions.

D. For indoor applications hose bibbs shall be Woodford Model 24P polished chrome finish.

E. Provide hose bibb with vacuum breaker loose tee key feature and shut off valve in water supply in all toilets rooms with floor drains (see floor plans for locations).

2.08 CLEANOUTS

A. Cleanouts for soil and waste pipes shall be provided at the bottom of each stack and at each change of direction. In interior horizontal runs install cleanouts at intervals not exceeding 50 feet on pipes up to four inches (4") in size and at intervals not exceeding 100 feet on larger size pipes.

B. Interior cleanouts shall be Zurn No. Z-1450-7 caulked into the lines and, where they occur in walls or finished areas, shall be provided with nickel-bronze tops or access plates; Zurn No. Z-1460-9. Provide Zurn No. Z-1415-2 with nickel bronze tops in all finished floors.

C. All interior cleanouts shall be the same size as the pipe served up to four inches (4") size and four inches (4") for all larger lines.

D. Refer to drawings for detail(s).

2.09 OIL SAND INTERCEPTOR (OIL/WATER SEPARATOR)

A. Provide where shown on Contract Document oil interceptor(s) of the size and capacity as scheduled.

B. Interceptor to be cast iron or 316 stainless steel constructions with acid resisting rubber base coating inside and outside. Provide adjustable gravity draw-off, removable baffle(s) and sediment bucket, and flow control fitting, all sized for the indicated peak flow rate.

Provide retention tank of the indicated capacity connected to gravity draw-off line with vent piping and suction connection to ground surface per manufacturer's recommendation.

C. Below grade piping for tank vents and gravity draw-off line shall be Schedule 80 PVC with threaded connections and sized to match interceptor connections.

2.10 WATER COOLERS/DRINKING FOUNTAINS

A. Fixtures used for the dispensing of potable water shall be provided at the locations shown on drawings and as scheduled.

B. Fixtures shall meet current accessibility standards.

C. Wall hung fixtures shall be provided with floor carriers anchored to the floor.

D. Coordinate with Division 26 installer the electrical requirements of the equipment.

PART 3 - EXECUTION

3.01 EQUIPMENT AND PLUMBING FIXTURES

A. Install all the equipment and plumbing fixtures in compliance with manufacturer's recommendations and as required to meet applicable codes.

B. Set all equipment properly leveled. Do not use the flanged joints as a method of correcting misalignments.

C. All pipes, etc. shall be tightly secured to and anchored to walls. Provide additional stiffening members on stud walls as required. Insulated pipes, hangers and supports shall have allowance for the continued, uninterrupted installation of insulation.

D. All wall-hung fixtures shall be provided with floor carriers anchored to floors. Lavatory carriers shall include concealed arms.

E. For all ADA compliant fixtures, mounting heights shall comply with Code requirements.

F. Coordinate with Division 26 installer the location of power supply outlets for hands free flush valves and faucets.

3.02 WATER COOLERS/DRINKING FOUNTAINS

A. Fixtures used for the dispensing of potable water shall be certified and labeled to indicate they are lead free. All labels shall be permanent and visible.

B. Wall hung units shall be installed free of movement and/or vibration. Provide floor carriers.

3.03 EQUIPMENT PERFORMANCE

A. Performance indicated on schedule(s) is based on the listed equipment manufacturer used as the basis of design. For all other listed manufacturers, shop drawing data shall indicate equal or better performance characteristics as the specified equipment.

3.04 HOSE BIBBS

A. Provide a shut off valve in the water supply line to each hose bibb. Valve shall be accessible. Refer Specifications Section 22 00 00 for access door / panel requirements.

3.05 TRAP PRIMERS

A. Trap primers shall be accessible for service. Refer to Specifications Section 22 00 00 for access door / panel requirements.

END OF SECTION – 22 10 00

SECTION 22 20 00 - PIPING GENERAL

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General Provisions, Supplementary General Provisions General Provisions and Section 22 00 00 shall apply to the Plumbing work shown on the drawings and specified under this Section of the specifications.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work specified herein with that of other trades affecting or affected by work of this Division 22. Cooperate with those trades to assure the steady progress of work under contract. Promptly notify Project Superintendent of any issues that may affect the work under this Division 22.

1.02 SCOPE OF WORK

A. This Section provides the general requirements and specifications for the piping materials and system components required for complete and fully operational plumbing systems.

B. Plumbing installer shall provide for each indicated piping system all the required labor, materials, transportation, permits, certifications, shop drawings, equipment, apparatus, tools, temporary construction and all other items needed for complete systems which are safe and ready for operation.

C. Provide all required excavation and backfill. Include cutting of concrete slabs.

D. Plumbing Piping Systems:

1. Sanitary waste and vent.

2. Domestic hot and cold water.

3. Grease, sand and oil collection systems, including traps, as shown on the contract documents.

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included as part of this Section. Installer shall review them for coordination with additional items of work related to the work under this Section.

22 00 00 Plumbing General Requirements
22 02 00 Operations and Maintenance Manuals
22 08 00 Painting and Identification
22 10 00 Plumbing – General
22 21 00 Piping

1.04 QUALITY ASSURANCE

A. For Quality Assurance requirements refer to Specifications General Provisions and Section 22 00 00.

1.05 SHOP DRAWINGS

A. Submit shop drawings for the following items as specified in this Section and shown on the contract documents.

Piping materials.
Insulation protection shields.
Dielectric fittings (unions – flanges).
Inserts.
Pipe hangers and supports.
Air vents.
Pressure gages.
Thermometers.
Thermometer wells.

B. For additional submission requirements refer to Specifications General Provisions and Section 22 00 00.

PART 2 - PRODUCTS

2.00 PIPING MATERIALS

A. Brass pipes shall be seamless drawn semi-annealed pipe containing not less than 85% copper and shall conform to ASA H27. 1.

B. Galvanized steel pipes shall be Schedule 40 black steel with galvanized malleable iron threaded fittings.

C. Copper pipes:

1. Copper pipes above ground shall be type 'L' hard drawn tubing.

2. Copper pipes below ground shall be type 'K' hard drawn tubing.

3. Copper piping 3/8 inch outside diameter and smaller, may be soft drawn.

D. PVC pipes shall be high impact Schedule 40 polyvinyl chloride Type I, ASTM E1785. This pipe shall carry the National Sanitation Foundation (NSF) seal of approval for potable water applications.

E. CPVC pipe: (when approved by owner submit for preapproval)

1. All CPVC Schedule 80 pipe shall be manufactured from a Type IV, Grade 1 Chlorinated Polyvinyl Chloride (CPVC) compound with a Cell Classification of 23447 per ASTM D 1784.

2. The pipe shall be manufactured in strict compliance to ASTM F441, consistently meeting the Quality Assurance test requirements of this standard with regard to material, workmanship, burst pressure, flattening and extrusion quality. The pipe shall be produced in the USA using domestic materials, by an ISO 9001 certified

manufacturer and shall be stored indoors after production, at the manufacturing site, until shipped from factory.

3. This pipe shall carry the National Sanitation Foundation (NSF) seal of approval for potable water applications.

4. Acceptable manufacturers are: Flowguard Gold and Harvel Plastics, Inc.

2.01 VALVES

A. Furnish and install valves specified herein; shown on drawings and necessary for the control and service of all piping systems and equipment. All valves shall be top quality, of approved manufacturer.

B. Each valve shall have the manufacturer's name or brand, the figure or list number and the guaranteed working pressure cast on the body and cast or stamped on the bonnet.

C. Except for special applications, all valves shall be the product of one manufacturer.

D. Acceptable valves manufacturers are: Jenkins, Walworth, Crane or Centerline. Where figure numbers of one manufacturer are indicated equivalent figure numbers of acceptable manufacturers can be substituted. Provide table of equivalence with shop drawings submittal.

E. All valves installed in insulated pipe systems shall have shaft extensions to facilitate insulation installation.

F. Valves shall be accessible and installed with proper clearances for service and operation and shall be tight at the specified test pressure. Provide service access to valves located in concealed spaces. Refer to Specifications Section 22 00 00 – Access Doors and Panels.

2.02 PIPING AND VALVE IDENTIFICATION

A. Refer to Specifications Section 22 08 00.

2.03 PIPE HANGERS AND SUPPORTS

A. Support piping inside the building directly from the building structure by means of adjustable wrought iron clevis type hangers. (Generally, we prefer 316ss hardware). Hangers similar to Grinnell Company Fig. 65 shall be used for pipe sizes 1-1/2 inches and smaller. Use Grinnell Fig. 260 for pipe sizes 2 inches and larger. For copper tube use Grinnell Fig. No. CT-269.

B. Hangers, supports, anchor and clips for copper piping shall be copper clad. When copper piping is carried on a steel trapeze hanger(s) with other piping, permanent isolation material such as Armaflex insulation shall be used to protect the copper from contact with those metals.

C. Hangers for insulated pipes shall be oversized to accommodate the insulation thickness.

D. When using threaded rods, double nuts shall be installed at each rod.

E. Maximum spacing between pipe supports shall be as follows:

NOMINAL PIPE SIZE (INCH)	ROD SIZE (INCH)	MAX SPAN (FEET)	MAX LOAD PER HANGER (LBS)
3/4 & UNDER	3/8	5	150
1	3/8	7	250
1-1/4	3/8	7	250
1-1/2	3/8	9	250
2	3/8	10	610
2-1/2	½	11	1130
3	½	12	1130
4	5/8	14	1430

F. Additional hanger supports shall be provided at each valve, fitting, change of direction, connections to equipment and dead ends of pipes longer than two feet.

G. Horizontal runs of PVC and CPVC pipes shall be provided with supports every four (4) feet.

2.04 INSULATION PROTECTION SHIELDS

A. Provide shields for all pipe hangers supporting insulated pipe. Shields shall be galvanized steel with flared ends.

B. Shields shall cover not less than the bottom 180º of the insulation and meet the minimum requirements listed below:

1/4 to 3-inch pipe 18 gauge x 12 inches long

2.05 DIELECTRIC FITTINGS

A. Provide dielectric unions or isolation flanges at all connections between copper and ferrous pipe and equipment.

B. Dielectric threaded union shall be as manufactured by EPCO Sales Company and Capitol.

C. When using flanged connections, a dielectric gasket shall be provided between flanges and plastic sleeves between bolts and flanges.

2.06 THERMOMETERS

A. Thermometers shall be of the separable socket, adjustable angle type, and minimum nine (9) inches long.

B. Thermometers shall be cast aluminum construction with metallic enamel finish and clear acrylic plastic window lens. Stem shall be brass and all fitting sand wells shall be brass. Wells shall have extension neck to extend through pipe insulation when installed on insulated piping system.

C. Filling fluid shall be red appearing mercury easily readable against a white background and temperatures shall be noted in black embossed figures.

D. Stem length shall be in accordance with companion thermometer well but not less than 3-1/2" long.

E. Install so that at least 75% of stem length is in the moving fluid stream. This may require increased length over the 3-1/2" specified above.

F. Range of thermometer shall be selected so that normal operating temperature is at approximate center of scale and highest possible temperature does not exceed full scale.

G. Acceptable manufacturers are: Dwyer, Trerice and Weiss.

2.07 PRESSURE GAGES

A. Pressure gages shall be minimum 4-1/2" diameter, cast aluminum structure with black finish. Clean glass window shall be mounted on a chrome plated closed type ring.

B. Gages shall be easily readable and have a white dial with black embossed figures, micrometer-type pointer with black finish.

C. Sensing element shall be a Bourdon type tube, silver brazed to tip, 1/4" brass unit. Movement shall be rotary-type, stainless steel with Delrin sector and phosphor bronze bushing. Accuracy shall be 1/2 of one percent of scale range.

D. Scale range upper limit shall be not less than 150%, and not greater than 200% of system operating pressure.

E. Acceptable manufacturers are: Weiss, Trerice, Dwyer, and Winters 300 series.

2.08 PVC-DWV PIPE AND FITTINGS

A. Pipe shall be Schedule 80 PVC, extruded from Type 1, Grade 1; Polyvinyl chlorine compound shall meet ASTM D-2665-68 Specifications.

B. Fittings shall be PVC Type 1, Grade 1.

C. Each section of pipe shall be continuously and permanently marked with the manufacturer's name or trademark, nominal pipe size, material, schedule or pressure rating at 73.4 degrees F. and quality control number. National Sanitation Foundation Symbol (NSF) must appear on all pipe and fittings.

D. All fittings shall be of molded type. All fittings for Schedule 80 pipe shall be Schedule 80.

E. Solvent cement used must be manufactured by the manufacturer of the fittings and consist of at least 15% by weight of the same PVC compound used in making the fitting.

F. All joints and connections shall be prepared, assembled and installed in complete conformance with the pipe manufacturer's recommendations. Joints or connections that can be twisted or parted by hand shall be cause for rejection of the complete PVC piping system or section thereof.

PART 3 - EXECUTION

3.00 PIPE AND VALVE IDENTIFICATION

A. Refer to Specifications Section 22 08 00 Painting and Identification.

3.01 EXCAVATION AND BACKFILL

A. Refer to specifications Section 22 00 00

3.02 PIPE DISTRIBUTION

A. Run all pipe parallel with and as close as possible to the nearest structural member. Run piping straight, plumb and grade in direction indicated on drawings. Set all piping true to line and grade.

B. Piping shall be laid out and installed with sufficient clearances to permit proper application of insulation. Relocate piping if a neat insulation job cannot be obtained.

C. In laying out the work, consult the Architect where there may be any question concerning routing of pipe where it may affect the final appearance of the work. Coordinate work with other trades working in the area.

D. Coordinate work with other trades working in the area. Failure to coordinate routing and elevation of pipes with ductwork installer and other trades may require the relocation of piping installed under this Section at no cost to the contract.

E. Pipes shall not be hung from other pipes, ducts or ceiling grid. They shall be supported directly from the building structure. In laying out the work, the contractor shall provide for proper access to valves, control devices and any other items at a later date. Pipes shall be so routed as to make access possible.

F. Copper pipes concealed in masonry partitions or supported against masonry shall be protected from contact with masonry by providing continuous cover of either two coats of asphalt-based paint, closed cell rubber insulation or a plastic sleeve with a minimum 0.032 inches wall thickness. Same care shall be exercised to prevent any contact of copper pipe with steel reinforcing, metal studs and other dissimilar metals.

G. Provide additional hangers as necessary for the proper support of valves, strainers, in-line pumps and any related equipment.

H. The equipment installed under this Section shall not be used to support the weight of pipes and accessories. Provide additional supports to the floor or building structure to relieve such weight.

I. Plumbing systems installer shall be familiar with building structure and provide additional steel members when necessary for the proper support of piping or any related equipment.

J. No welding or cutting of building framing and support members shall be permitted without the written approval of the Structural Engineer.

K. All supports shall be from the building structure. On concrete structures, drill and set in place expansion anchors for pipe hangers. The use of gunpowder driven impact anchors is prohibited.

L. Set all equipment properly leveled and aligned with associated piping. Do not use the flexible joint connectors as a method of correcting misalignments.

M. Provide sway control hangers on pipe runs when there is a change of direction larger than 45º on the horizontal plane.

3.03 VALVE CONTROL

A. Valves shall be installed where shown on plans, where necessary to facilitate service of sections of the piping system(s) and at the inlet and outlet connections to all fixtures and equipment.

B. Water lines to rooms with multiple plumbing fixtures, such as restrooms, kitchens, janitor's rooms shall be provided with isolation valves. Locate valves above corridors with accessible ceilings, otherwise hinged ceiling access panels shall be provided as per Specifications Section 22 00 00.

C. These valves are in addition to standard shut off service valves located at each fixture.

D. Water lines for hose bibbs shall have dedicated shut off valves.

E. All domestic water shut off valves shall be full port ball valve type.

3.04 SLEEVES

A. Provide pipe sleeves where pipes pass through masonry walls, roofs and floors. Sleeves shall be schedule 40 PVC, except penetrations of fire rated walls or partitions where schedule 40 steel sleeves shall be used. Sleeves installed in floors shall extend 1/2 inch above finished floors. Exceptions are sleeves in mechanical rooms and rooms with waterproof membrane, which shall extend 2 inches above finished floor.

B. Sleeves shall be sized to allow a minimum of clearance between pipe or pipe insulation and sleeve. Sleeve installed for piping subject to movement shall not restrict movement.

C. The space between sleeves and pipe shall be packed with oakum and sealed with a UL listed waterproof sealant. Also refer to the Architectural Section of the Contract Documents for other approved materials and methods.

D. Plastic sleeves shall be installed at all copper piping penetrations of metal studs. Sleeves shall be Greenlee type # 712C or approved equal.

E. Where piping must penetrate existing slab, beams or masonry wall, contractor shall core bore a hole of the minimum size required to allow the pipe sleeve to be installed. The area between the hole and pipe sleeve shall be sealed with a UL listed, non-hardening, caulk. All core drilling shall be done under the direction of the structural engineer at indicated locations.

F. Pipe penetrations of fire or smoke rated walls and floors shall be sealed to maintain the integrity of construction. Refer to Paragraph "Fire stopping" in Section 22 00 00 Plumbing – General. When applicable, requirements of the fire assembly UL listing shown on the Architectural plans must be followed and supersede any other requirements of this

Section.

G. Steel pipe sleeves in contact with concrete or masonry shall be protected with two (2) coats of asphalt-based paint, evenly applied over the pipes before they are set in place.

3.05 PIPE JOINTS

A. Clean all pipe and fittings before jointing. Ream the ends of pipe having screwed, welded or soldered joints to remove all burrs after cutting.

B. After threading and/or cutting, swab out the pipe to remove all foreign matter.

C. SCREWED PIPE: All threads must be clean and sharp. Pull joints up tight using an approved joint compound applied to male threads only, except as otherwise specified. Make screwed joints in piping containing hydrocarbons with litharge and glycerin in lieu of red lead joint compound.

D. SOLDERED JOINTS: Make joints as recommended by the solder manufacturer, using solder as indicated.

E. FLARED JOINTS: Make joints as recommended by the fitting manufacturer.

3.06 CONNECTIONS TO EQUIPMENT

A. On screwed and soldered piping systems provide unions at each service valve and at each pipe connection to equipment.

3.07 PENETRATION OF WALLS, PARTITIONS AND DECKS

A. Work under this section includes thorough and complete caulking on both sides of all penetrations through walls, partitions and roof decks whether such penetration occurs above or below ceiling lines.

B. Coordinate penetrations of precast concrete elements with the manufacturer. The installer of the precast work shall do penetrations and patching.

C. Penetration of masonry work shall be done by and patched by skilled masons.

D. All penetrations shall be cut in a manner that the hole is uniformly 1/8 inch clear all around the item penetrating it (including insulation).

E. All caulking work shall be done in strict compliance with requirements of Section Caulking and Sealants.

F. Any pipe penetration of a wall, partition, floor or roof deck, which vibrates, shall be treated so no vibration is transmitted at point of penetration.

3.08 TEST OF PIPING SYSTEMS

A. The objective of these tests is to prove the adequacy, quality, and safety of all piping systems and assure that operating pressures can be safely maintained.

B. All leaks detected during these tests shall be promptly corrected and piping systems shall then be retested.

C. Furnish necessary instruments, test equipment, water, power, fuel and personnel required for tests, and make provisions for removal of test equipment and draining of pipes after tests have been completed.

D. Contractor shall notify the Architect at least 72 hours in advance of any test that will be ready for observation by the Architect or his designated representative. Failure to comply with this request will not allow the Architect or his representative to properly schedule his visit to the site and the test must remain on until the field observation can be accomplished.

E. In the event the Architect or his designated representative is unable to observe the piping under test, the contractor shall proceed as follows:

Observe all tests and furnish a letter for each test to the Architect within 5 days of the test completion certifying that the test was performed. Include the following information.

1. Type of system tested

2. Date of test

3. Test pressure

4. Medium used for test (water, air, etc.)

5. Exact location and extent of system tested.

6. Duration of test.

F. Tests may be performed on partial sections of the system only if the section must be concealed to permit normal progress of the project. The installer shall overlap test sections by one joint for partial tests to insure that all joints are subjected to test. Upon completion of the system, the entire system shall be given a final test and be certified by the contractor.

G. All tests shall be performed and certified by the contractor prior to any painting, insulating or concealment of the piping.

H. Systems shall be tested as described herein except where a local or other applicable code has more stringent requirements, which shall then be followed. Other systems shall be tested as indicated on applicable sections of these specifications.

END OF SECTION – 22 20 00

SECTION 22 21 00 – PIPING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General Provisions, Supplementary General Provisions General Provisions and Section 22 00 00 shall apply to the Plumbing work shown on the drawings and specified under this Section of the specifications.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work specified herein with that of other trades affecting or affected by work of this Division 22. Cooperate with those trades to assure the steady progress of work under contract. Promptly notify Project Superintendent of any issues that may affect the work under this Division 22.

1.02 SCOPE

A. Plumbing installer shall provide for each indicated piping system all necessary and required labor, transportation, permits, certifications, shop drawings, etc.

1. Domestic hot and cold water piping

2. Sanitary waste, drain and vent piping. When indicated provide air admittance valves.

3. Grease, sand and oil contaminated waste piping.

B. Furnish and install all necessary required materials, equipment, apparatus, tools, temporary construction and all other items needed for a complete system, which is safe and ready for operation.

C. Do all required excavation and backfill.

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

22 00 00 Plumbing General Requirements
22 02 00 Operations and Maintenance Manuals
22 08 00 Painting and Identification
22 10 00 Plumbing – General
22 20 00 Piping General – Plumbing

1.04 QUALITY ASSURANCE

A. All materials used for potable domestic water systems shall have National Safety Foundation (NSF) seal.

B. For additional Quality Assurance requirements refer to Specifications General Provisions and Section 22 00 00.

1.05 SHOP DRAWINGS

A. Submit shop drawings for the following items as specified in this Section and shown on the contract documents.

Gate valves.
Globe valves.
Check valves.
Butterfly valves.
Ball valves.
Pressure reducing valves.
Balancing valves.
Premolded pipe covers.
Water hammer arrestors.
Vent caps.
Air vents.
Escutcheons.
Cocks.

B. For additional submission requirements refer to Section 22 00 00.

PART 2 - MATERIALS

2.01 DOMESTIC WATER PIPING (HOT-COLD) (HEAT RECLAIM)

A. Temperature: Up to 200^{o}F.

B. Operating pressure: 125 psig maximum.

C. Underground pipe:

1. 2-1/2 inches and smaller-type "K" hard temper copper tube.

D. Aboveground pipe:

1. Type "L" hard temper copper tubes.

2. Type 316/316L, plain ends.

E. CPVC pipe: (when approved by City; submit request)

1. All CPVC Schedule 80 pipe shall be manufactured from a Type IV, Grade 1 Chlorinated Polyvinyl Chloride (CPVC) compound.

2. This pipe shall carry the National Sanitation Foundation (NSF) seal of approval for potable water applications.

F. Fittings:

1. Fittings: 150 lbs. wrought copper with socket ends.
2. PVC and CPVC: Fittings shall be product of the pipe manufacturer and match pipe schedule.

G. Unions: 2-1/2 inches and smaller. 125 lbs. cast copper. Socket ends, copper-to-copper seat.

H. Solder

1. Copper pipe: 95% tin/5% antimony. The use of acid is prohibited. The use of lead containing solder is prohibited. Use of lead free solders with a tin/copper/silver composition such as Silvabrite 100 is acceptable.

I. Valves:

1. Gate Valves-Underground:

a. 2-1/2 inches and smaller-125 lbs. screwed, iron body, bronze trim-non-rising stem with solid wedge disc. Acceptable products are: Crane No. 490, Nibco No. T-619 and Jenkins 40BJ. (The 490 gate is a U-bolt style and preferred for underground because of ease of repair.)

2. Gate Valves Aboveground

a. 2 inches and smaller-125 lbs. soldered, bronze, solid wedge disc, non-rising stem screwed bonnet. Acceptable products are: Crane No. 1320, Nibco No. S-113 and Jenkins 313J.

b. 2-1/2 inches and larger-125 lbs. flanged iron body, bronze trim solid wedge disc. Acceptable products are: Crane No. 465- 1/2, Nibco No. F-617-0 and Jenkins 525J.

3. Globe Valves:

a. 2 inches and smaller-125 lbs. solder joints bronze screwed bonnets, composition disc. Acceptable products are: Crane No. 1310, Nibco No. S-211-Y and Jenkins 106BPJ.

b. 2-1/2 inches and larger-125 lbs. flanged iron body-bronze trim. Acceptable products are: Crane No. 351, Nibco No. F-718-B and Jenkins 2342J.

4. Check Valves:

a. 2 inches and smaller-125 lbs. soldered bronze Y-pattern swing check composition disc. Acceptable products are: Crane No. 1342, Nibco No. S-433 and Jenkins 4093J.

b. 2-1/2 inches and larger – 125 lbs flanged iron body-bronze trim swing check valve. Acceptable products are: Crane 373, Nibco F918 and Jenkins 587J.

5. Ball Valve:

a. 1/2 through 1 1/2 inches: Forged brass body, full port valve, chrome plated brass ball, brass stem, PTFE seats, with Push-to-Connect ends. Victaulic Series 300.

b. Brass ball valves shall be full port. One-quarter (1/4) turn lever handle

operated, hot forged brass. 100% full port. Valves shall have blowout proof stem and 2-piece body design. Gland follower and single O-ring stem design Teflon seats and stem packing.

6. Pressure Reducing Valves:

a. 2 inches and smaller-300 lbs. screwed bronze. Acceptable product is: Watts No. U5.

J. The use of PVC or CPVC pipes in return air plenums or exposed to air-conditioned spaces is prohibited. Cast iron, steel and copper pipe only shall be used in those areas. Refer to the Mechanical Section of the contract documents for the type of air conditioning system being installed in this project.

2.02 SANITARY PIPING (SOIL, WASTE, VENT)

A. Pipe-Exterior Underground

All exterior underground sanitary piping shall be high impact Schedule 80 PVC-DWV with socket ends. Coordinate with piping materials specified in the Civil Engineering documents.

B. Pipe-Under Building and Aboveground

All soil, waste, and vent piping shall be Schedule 80 PVC-DWV ASTM D2665-68.

C. Fittings-Under Building and Aboveground

Soil, waste and vent pipe fitting shall be Schedule 80 PVC joints ASTM D2665-68, solvent welded.

D. The use of PVC in return air plenums or exposed to air-conditioned spaces is prohibited. Cast iron pipe only shall be used in those areas. Refer to the Mechanical Section of the contract documents for the type of air conditioning system being installed in this project.

2.03 PREMOLDED PIPE COVERS UNDER LAVATORIES

A. Provide premolded insulation covers over P-trap and water supplies under lavatories/sinks designated for handicap applications.

B. Premolded covers shall be as follows:

1. Covers shall meet Federal, ANSI and local code requirements.

2. Covers shall be molded closed cell vinyl, minimum 3/16" thick. Fasteners shall be nylon and be supplied with kit. Insulation "k" value shall be 1.17 or higher.

3. Covers shall be suitable for field painting. For field painting requirements refer to another section of the Specifications.

4. Covers shall be self-extinguished, tested in accordance with ASTM D63J.

C. Covers shall be Handi Lav-Guard Insulation as manufactured by TRUEBRO or ProWrap-McGuire Products.

2.04 WATER HAMMER ARRESTORS

A. Provide water hammer arrestors with nesting type bellows. Casing to have sufficient displacement volume to dissipate the kinetic energy generated in the piping system.

B. Both casing and bellows to be constructed of stabilized 18-8 stainless steel.

C. Stainless-Steel Bellows may not take a permanent set even if expanded by static line pressure for prolonged periods. Bellows shall not split or tear under stress.

D. Bellows shall be fusion-welded under argon-gas shield with controlled constant provisions.

E. Bellows shall be unaffected by hot water temperatures up to 300ºF and be rated for 125 PSI working pressure or 250 PSI static pressure.

F. Arrestors shall meet Standard No. PDI-WH201 of the Plumbing and Drainage Institute.

G. Hammer arrestors shall be Zurn Shoktrols. Other acceptable manufacturers are Josam and Wade. Refer to Project Manual for required documentation when requesting acceptance of other non-listed products.

PART 3 - EXECUTION

3.01 PIPING

A. Installation of piping shall comply with the requirements of Specifications Section 22 20 00 and as herein specified.

B. Installer shall promptly install all sewer, drains, and piping after chases or cutting for same has been done, so as to keep the openings for such piping open as short a time as possible. No piping shall be permanently closed up, furred in or covered before examination by the authorities having jurisdiction.

C. All piping shall be run in the most direct manner. Horizontal storm, soil and waste pipe shall have a grade of one-quarter inch (1/4") per foot wherever possible and not less in any case than one-eighth (1/8") per foot. All offsets shall be 45º or less. At offsets greater than 45º, cleanouts and additional supports must be provided.

D. All water piping shall be run free from traps and arranged so that all parts of the system can be drained. Provide accessible one-half inch (1/2") gate valves with hose end where required for this purpose.

E. Reducing fittings shall be used where any change in the pipe sizes occur. No bushings of any nature are allowed.

F. Provide dielectric couplings when ferrous and non-ferrous metals are jointed. Dielectric couplings shall be as manufactured by EPCO or approved equal.

G. Vent branches shall be kept above the fixtures in such a manner as to preclude the use of the vents, as waste pipes should the latter become obstructed. All branches shall be so graded as to prevent accumulation of water or scale therein. All vent pipes shall be properly graded without drops or sags and so connected as to drip back to waste pipes by gravity. Wherever practicable, two or more vents shall be connected together and

extended as one vent through the roof.

H. Exposed waste and vents pipes shall be chrome-plated brass (iron pipe size).

I. Provide swing connections throughout the piping systems to allow for horizontal and vertical expansion and contraction.

J. Unions or companion flanges shall be provided for easy removal of all equipment.

3.02 AIR CONTROL / AIR VENTS

A. At the high point of water supply system, furnish and install automatic air vent valve. Vent valves shall be TACO No. 426 or approved equal. Discharge room air vent valve shall be piped to an appropriate drain.

3.03 PIPE SUPPORTS

A. Vertical piping shall be supported at each stack base and at each floor. Freestanding vertical pipes should be adequately staked or braced during construction to maintain alignment.

B. Horizontal piping shall be supported within 24 inches of any elbows and hangers shall be properly placed to maintain alignment and grade with provision made to prevent shear. Large diameter pipes should be braced at changes of direction to prevent horizontal movement. For hanger specifications and spacing refer to Specifications Section 22 20 00.

C. PVC and CPVC horizontal lines shall have supports every four feet (4’).

3.03 EXCAVATION AND BACKFILL

A. Refer to Specifications Section 22 00 00.

3.04 FLASHING CONNECTIONS

A. Where the vents pass through the roof, the openings shall be provided with sheet lead flashing weighing not less than four (4) pounds per square foot. The flashing shall be made watertight at the roofline and be extended up, over and down at least two inches (2") into the pipe. Each flange shield shall extend not less than fourteen inches (14") in all directions from the respective vent, underneath the roofing material.

3.05 VALVE CONTROL

A. Valves shall be installed where shown on plans and/or where necessary to facilitate the servicing of sections of the domestic water system.

B. Valves shall be provided on all inlet and outlet connections to all fixtures, apparatus, all risers and all groups of fixtures or kitchen equipment.

C. Groups of fixtures shall be arranged to have their group valves in one location.

D. Access to all concealed valves shall be provided by means of access doors. Refer to Specification Section 22 00 00 paragraph Access Doors and Panels.

E. All domestic water shut off valves shall be full port ball valve type.

3.06 PREMOLDED PIPE COVERS FOR LAVATORIES

A. Insulate P-trap and water supplies under lavatories/sinks for handicap applications using fully molded, pre-insulated covers as specified in Specifications Section 22 10 00.

3.07 SLEEVES

A. Refer to Specifications Section 22 20 00 – Piping General.

3.08 ESCUTCHEONS

A. Install escutcheons at all exposed wall, ceiling and floor pipes penetrations. Pipe penetrations inside cabinets shall also be covered. Escutcheons shall match piping materials or as herein indicated.

B. Escutcheons shall completely cover the opening around the pipe penetration. Coordinate with contractor for general construction when this is not feasible so other means may be used to seal opening(s).

3.09 TESTS

A. Perform all required tests in accordance with the requirements of Specifications Section 22 20 00 and as herein specified. Where more stringent Codes apply, they shall then be followed.

B. Soil, waste, vent, and storm piping. Test the system with a 10-foot hydrostatic pressure for a minimum of 2 hours.

C. Domestic hot and cold water copper pipes. Test the system at 100 psi hydrostatic pressure for 2 hours.

D. PVC and CPVC pipes. Test at system operating pressure plus 10% and held for 24 hours.

3.10 DISINFECTION AND STERILIZATION

A. Provide for the disinfection and sterilization of all piping systems used for the storage, heating, supply, distribution and dispensing of potable fluids. Include all wetted parts and accessories thereof. Work shall comply with the requirements of Florida Building Code, 2017 – Plumbing, local Water Utility, local Health Department and other Agencies having jurisdiction.

B. Plumbing installer shall arrange and pay all costs for testing of water samples as required by the governing authority. Provide required sample testing and injection connections. After acceptance of piping installation by the authorities having jurisdiction, remove and cap connections.

C. Submit three (3) copies of test reports to the Architect / Engineer and the Owner's authorized representative. Additional copies to be included in the Operations and Maintenance Manuals. Refer to Specifications Section 22 01 00.

D. Projects involving multiple buildings or phasing of construction may have each building or phase tested independently to facilitate occupancy. However, once construction is completed, a final test of the entire installation must be done.

3.11 WATER HAMMER ARRESTORS

A. Provide manufactured water hammer arrestors on all hot and cold domestic water supplies at each faucet, control valve or flush valve, except lawn faucets, wall hydrants and hose bibbs.

B. Arrestors shall be concealed and arranged so as to protect all plumbing fixtures. When a unit of equipment is located at the remote end of a long run of piping, the arrestor should be placed as close to the point of valve closure as possible.

C. Submit shop drawing of layout and location of arrestors before installation, for review by Architect / Engineer.

D. Water hammer arrestors and air chambers shall be installed at accessible locations. Provide access doors / panels as required for such access. Access Doors / Panels shall meet requirements of Specifications Section 22 00 00.

END OF SECTION – 22 21 00

SECTION 23 00 00 – MECHANICAL GENERAL REQUIREMENTS

Part 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General and Supplementary Conditions of the Contract; General Provisions and of Section 23 00 00 shall apply to the Mechanical work shown on the drawings and specified under this Division 23. When in conflict the requirements of the Contract and General Provisions supersede those listed on Division 23.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work specified herein with that of other trades affecting or affected by work of this Division 23. Cooperate with those trades to assure steady progress of work under contract. Promptly notify Project Superintendent of any issues that may affect the work under this Division 23.

1.02 SCOPE OF WORK

A. Provide the labor, materials and equipment for the installation and testing of the mechanical equipment and systems shown on the drawings and herein specified.

B. All systems shall be complete, tested and ready for operation at time of Substantial Completion. Refer to Specification General Provisions and Sections 23 01 00.

C. Refer to each Section of this Division 23 for the specific scope of work under that Section.

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

23 08 00 Painting and Identification
23 41 00 Corrosion Protection
23 70 00 Fans and Vents
23 95 00 Test and Balance

1.04 RELATED WORK NOT INCLUDED IN THIS DIVISION

A. Refer to related Sections of the Contract Documents for work to be provided by others such as but not limited to:

Electrical Work - Refer to Division 26

1.05 DEFINITIONS

A. Specific items of terminology, as used herein, shall have the following meanings:

1. BY OTHER TRADES: Shall mean work that is to be provided by persons or parties responsible for work at the project other than the party or parties who have been awarded a contract for work under this Division15.

In the event that this document is used to acquire work as part of a general construction contract, the words "by other trades" shall mean by persons or parties who are not anticipated to be the installers for the work shown under this Division 23. In this context, the words "by other trades" shall not be interpreted to mean, “not included” in the overall contract.

2. DEMOLITION: Shall mean the removal of any existing equipment, piping, ducts, etc. and the temporary or permanent capping or plugging of indicated existing services

3. DUCTWORK: Shall mean ducts, fittings, dampers, controls, hangers, insulation, and any other items customarily required in connection with the installation of systems for the movement and or distribution of air. Include all tests and the test and balance of such systems.

4. EXPOSED: Shall mean work that is not concealed.

5. FURNISH: Shall mean purchase and deliver to the project site indicated equipment and/or materials complete with necessary rigging, appurtenance and supports.

6. PROVIDE: Shall mean FURNISH and INSTALL.

7. WORK: Shall mean to include all materials, labor, equipment, tests and test and balance required for a complete and operable installation.

B. Except where modified by specific notation to the contrary, it shall be understood that the indication and/or description of any item, in drawings or specifications or both, carries with it the instruction to furnish and install item, regardless of whether or not this instruction is explicitly stated as part of indication or description.

1.06 QUALITY ASSURANCE

A. General

1. Refer to requirements of General Provisions. It is the intent of the drawings and specifications to obtain a complete and operable installation.

2. All materials shall be new, properly labeled and/or identified, and in full compliance with the contract documents and applicable Codes and Standards.

3. All work shall comply with applicable Codes and Standards at the time the project is bid.

4. Manufacturer's model names and numbers used in this Division 23 are subject to change per manufacturer's action. Contractor shall therefore verify applicable information with manufacturer's representative before ordering any product or equipment. Notify Engineer of any changes and promptly furnish, for their review, information on new or replacement product. Changes shall be at no cost to the contract.

B. Installer's Qualifications

1. Installers performing work under this Division 23 shall be both a State and local licensed firms regularly engaged in providing the work specified under each Section of these Specifications. Provide copy of license upon

request.

2. Each installer shall provide, upon request, a list of at least five similar jobs he has completed in the last two (2) years. Also refer to requirements of General Provisions.

C. Drawings and Specifications

1. Drawings are diagrammatic but shall be followed as closely as actual construction of the building and the work of other trades will permit.

2. The specifications and drawings are complementary and are to be taken together for a complete interpretation of the work. Notes or details on drawings which refer to an individual element of work and that may conflict with the specifications shall be brought up to the attention of the Engineer for clarification before any equipment or materials are purchased or work is installed. Failure to follow these guidelines may cause the contractor to replace / correct the work at no cost to the contract.

3. The separate divisional drawings and specifications do not relieve the contractor from the responsibility to provide the work, which is indicated on any of the drawings or division of the specifications.

4. The drawings of necessity utilize notes, details, symbols and schematic diagrams to indicate various items of work. Therefore, no interpretation shall be made from the limitations of such notes, details, symbols and diagrams that any elements of work necessary for a complete installation are excluded. Any discrepancies shall be brought to the attention of the Engineer for clarification before bid time and the purchasing and installation of any equipment or materials. No work shall proceed until issues are resolved. Failure to follow these guidelines may cause the contractor to replace/correct the work at no cost to the contract.

5. Details, sections and enlarged plans that appear on the drawings are intended only for the purpose of establishing general feasibility. They do not supersede field coordination of the indicated work among the various trades working in that area.

6. Examine and coordinate site conditions, electrical, drawings and specifications prior to submitting bid. Any discrepancies shall be brought up to the attention of the Engineer.

7. The Engineers shall be notified of any discrepancies, omissions, conflicts or interferences, which occur between drawings and specifications. If such notification is received in adequate time prior to bid time additional data or clarifications will be issued by addendum to all bidders. Failure to follow these guidelines may cause the contractor to replace/correct the work at no cost to the contract. See note 4 above.

8. When extra work involving Division 23 trades is authorized, the work as shown on drawings, sketches, described by Addendum or Change Order is subject to this Specification in all respects.

D. Standards

1. Certain materials and installation procedures are described by reference to industry standards published by nationally recognized organizations such as, but not limited to, those listed below:

American Society for Testing Materials (ASTM)
National Fire Protection Association (NFPA)
National Electrical Manufacturers Association (NEMA)
Underwriter's Laboratories (UL)
American National Standards Institute (ANSI)
American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)
Sheet Metal and Air Conditioning Contractor's National Association (SMACNA)
Air Movement and Control Association (AMCA)

2. Additional standards may be listed in other Sections of the Specifications and in the 2017 Florida Building Code.

3. Whenever a reference is made to a standard, installation and materials shall comply with the **latest adopted and published edition of the Standard at the time project is bid**.

E. Requirements of Government Agencies

1. The work under this contract shall comply with the standards and requirements of the City of Tampa Wastewater Department.

2. The contractor, at no cost to the contract, shall correct any work found to be in noncompliance with those Standards.

1.07 PERMITS, FEES AND INSPECTIONS

A. Contractor shall give the necessary notices, obtain all permits and pay all government fees, sales taxes and other costs in connection with this work.
B. Obtain all required certificates of inspection for work and deliver them to the Engineer before requesting acceptance and final payment for the work.

1.08 CODES AND RULES

A. All work specified and installed under Division 23 shall comply with the Florida Building Code, 2017.

B. Applicable codes shall be those adopted by the authority having jurisdiction at the time project is bid.

C. Installer’s of work specified under Division 23 shall include in the work, without extra cost to the contract the labor, materials, services, apparatus and drawings required to comply with applicable laws, ordinances, rules and regulations before submitting his bid.

D. Installer shall inform the Engineer of any work or materials which conflict with any of the applicable codes, standards, laws and regulations before submitting his bid.

1.09 FIELD CHANGES DURING CONSTRUCTION

A. Occasionally during construction changes that deviate from the approved permit documents may occur.

B. Local authorities may require that the changes be submitted for their review via

signed and sealed documents indicating the design professional concurrence with said changes. Contractor shall therefore notify the design professional of any changes before proceeding with the work and provide justification for the change including supporting sketches detailing the extent and nature of the change.

C. Failure to follow this procedure may delay the design professional response until he / she is satisfied with the need for the change.

D. When changes are made for the contractor's sole convenience, contractor assumes full responsibility for reimbursing the design professionals for his / her time and other expenses. This includes changes caused by lack of coordination between installing contractors working in a common area.

Part 2 - EXECUTION

2.01 ORGANIZATION OF THE WORK

A. At all times a competent superintendent shall be on site in charge of the work. Replace if performance is unsatisfactory to the Owner and/or Engineer.

B. Maintain a complete file of all contract and shop drawings at the site available for review by Owner's representatives and Engineer. A set of drawings shall be dedicated as the "As Built Record Set" where all changes and / or deviations from the contract documents are noted as they occur. Refer to Specifications General Provisions.

C. Upon installation of equipment, shop drawings shall be initialed and dated. This procedure will ensure proper scheduling and allow Owner's representatives and Engineer to check the work in progress.

D. A set of the ductwork shop drawings shall be kept on site for use by the Test and Balance Agency and the contractor. They shall highlight the sections of duct being pressure tested and note date of the test. Names of individuals conducting the test shall be listed next to the date.

2.02 COORDINATION WITH OTHER TRADES

A. Coordinate work to be installed under Division 23 with other trades and existing field conditions to avoid interferences and delays. Assist in working out space requirements to make a satisfactory installation. Notify the Engineer of any major conflicts that cannot be resolved through normal field coordination with other trades.

B. When work by others is installed before it is coordinated with the work of Division 23 trades, and as a result interferes with the Division 23 trades work, the installer responsible for causing the conflict shall make the necessary changes in his work to correct the condition at no cost to the contract. Notify Engineer of such conflicts. Contractor is responsible for reimbursing the Engineer for his time and cost in assisting in the resolution of such issues.

C. Furnish to other trades all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

D. Local authorities may require that field changes that deviate from the contract documents be submitted for their review via signed and sealed documents that indicate design professional concurrence with said changes. **Contractor shall**

notify the design professional of such changes <u>before</u> proceeding with work and provide justification for the change. Failure to follow this procedure will make the contractor responsible for all costs associated with the change including design professional's time and other expenses. This includes changes caused by lack of coordination between installing contractors working in a common area.

2.03 CUTTING AND PATCHING

A. When openings in walls/roofs are provided under the work of other sections, this installer shall furnish exact dimensions and locations of those openings.

B. No structural members shall be cut without the previous written approval of a Structural Engineer. This contractor is responsible for providing such engineering services. Provide copies of information to Design Professional.

2.04 EXAMINATION OF EXISTING CONDITIONS

A. This project includes work in an existing facility; therefore contractors shall visit the site and examine those areas of the existing buildings affected by this work. Contractor shall become familiar with existing conditions and difficulties that may affect the execution of the work before submitting proposals.

B. Submission of a proposal shall therefore be construed as evidence that such examination has been made and later claims for labor, equipment or materials required because of difficulties encountered, which could have been foreseen had such examination been made, will not be recognized.

C. Upon completion of his site visit contractor may submit a list of questions requesting the clarification of items noted during his visit. Submit request within the time frame shown on the General Conditions of the contract and General Provisions. Late requests will not be accepted.

2.05 DEMOLITION

A. Demolition shall be as shown on drawings and/or herein specified.

B. Schedule all demolition work to cause minimum downtime of any building service or function. No extra cost to the contract will be allowed for overtime work unless authorized in writing by the Owner / Engineer.

C. At each location where work is to be performed, the Contractor shall examine the existing conditions to determine the nature and extend to which the existing systems must be removed, modified or rearranged to accomplish the work of this contract. In addition, the Contractor shall determine the extent to which portions of the existing building must be cut, altered and restored to accommodate the project modifications. In every instance, the Contractor shall be responsible for the correctness, adequacy, fit and alignment of new work with existing conditions, and for the satisfactory restoration of affected building work as approved by the Owner.

D. The Contractor shall protect existing building contents, equipment, fixtures, the building structure and its finishes from damage due to dust, falling debris, or any other work operations. Repair or replace any damage to existing facilities at no extra cost to the contract.

E. Equipment or other items to be modified or relocated shall be carefully dismantled or disconnected in a manner to avoid damage. Items damaged by the contractor's operations shall be replaced or repaired in a manner satisfactory to

the Owner. Items not to be re-used shall be removed from the site by the Contractor. Those items that are identified to be turned over to the Owner shall be stored on the site at a designated location.

F. In each area where work is performed, the work area shall be kept in a neat, clean condition. Rubbish and debris shall not be allowed to accumulate and shall be removed daily if necessary to maintain clean conditions satisfactory to the Owner.

2.06 SEQUENCING AND SCHEDULING OF WORK

A. All work to be performed under this contract shall be carried out in accordance with an approved construction sequence and schedule. Upon award of the contract, and prior to commencing work at the building, the Contractor shall prepare and submit a detailed schedule of his proposed sequence of work and the dates of completion of the various portions of the work.

B. Where existing active building systems and services must be disrupted to permit modification, relocation or connection of new work, the work shall be carefully planned to minimize downtime. In each instance, preparatory work shall be completed to the maximum extent possible, and required tests completed where feasible, before the particular system or service is shut down to permit final connection or switch over.

2.07 STORAGE OF EQUIPMENT AND MATERIALS

A. All equipment and materials shall be stored on site in a dry location where they are properly protected from the weather, injury or deterioration. Materials shall not be stored in contact with the ground or floor.

B. Do not remove manufacturer's packing materials until ready to install.

C. Materials showing signs of corrosion or damage due to improper handling or storage shall be replaced at no cost to the contract.

D. Provide continuous protection for all equipment and materials already installed.

2.08 WATERPROOFING

A. Where any work pierces waterproofing including waterproof concrete, the method of installation shall be as approved by the Engineer before work is done.

B. Provide all necessary sleeves, caulking and flashing required to make openings absolutely watertight. Waterproof flashing materials shall be compatible with base materials.

2.09 EQUIPMENT SERVICE

A. Provide clearances around equipment as required by Code, owner standards and equipment manufacturer for the proper maintenance or removal of equipment. The most stringent requirements shall apply.

B. Coordinate with other trades so no conduit or other equipment interferes with the required clearances.

C. Notify project superintendent when work by other trades needs to be relocated in order to maintain required clearances. Notify Engineer if conditions persist and are not corrected by the responsible trade.

END OF SECTION – 23 00 00

SECTION 23 01 00 - PROJECT CLOSE OUT

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General and Supplementary Conditions of the Contract; Specifications General Provisions and Section 23 00 00 shall apply to the HVAC work shown on the drawings and specified under this Section.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work specified herein with that of other trades affecting or affected by work of this Division 23. Cooperate with those trades to assure steady progress of work under contract. Promptly notify Project Superintendent of any issues that may affect the work under this Division 23.

1.02 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

23 00 00 HVAC General Requirements
23 08 00 Painting and Identification
23 42 00 Direct Expansion (DX) Mechanical HVAC Equipment
23 70 00 Fans and Vents

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

3.01 TOOLS

A. All special tools for proper operation and maintenance of the equipment provided under this specification shall be delivered to the Owner's representative and a receipt requested.

3.02 SUBSTANTIAL COMPLETION

A. Refer to the General and Supplementary Conditions of the Contract and General Provisions of the Specifications for additional requirements applicable to this Section. When in conflict, those requirements take precedence over this Section.

B. Representatives of the installers responsible for work under this Division 23 shall be present at the time of the Substantial Completion. They shall have tools and ladders available to assist the Architect / Engineer and to promptly correct any deficiencies that may be identified.

C. Division 23 installers shall be in compliance with the following:

1. All work shown on the contract documents shall be completed and fully operational.

2. The contractor shall perform his own review of the work prior to requesting the Substantial Completion visit. The contractor shall provide a hard copy of his punch list to the Architect / Engineer when submitting his request.

3. Systems and equipment shall be tested and balanced to assure compliance with contract documents. Provide the Architect / Engineer with copies of Test and Balance Report at least one week prior to the scheduled Substantial Completion visit.

4. Furnish a letter from the Building Automation System (BAS) manufacturer and/or installer certifying that the controls for the air conditioning system have been tested and calibrated and that systems perform as intended. Testing shall include controls software and all Sequence of Operations.

6. Replace temporary filters with the specified clean final filters.

7. Clean coils, equipment and ducts that may have accumulated dust during construction. Refer to requirements of Section 23 00 00, Paragraph, Operation of Air Conditioning Equipment during construction.

D. Architect / Engineer shall furnish contractor with a list of items noted during the Substantial Completion visit that need to be corrected. Contractor shall notify the Architect / Engineer in writing of any items appearing on that list that are disputed by Installer.

E. When listed items have been corrected and/or completed, Contractor shall request in writing another review of the work. Request shall include a copy of the original punch list with the initials of the contractor's representative who has verified that the items on the punch list have been completed.

F. Contractor shall be responsible for the costs associated with additional site visits by the Architect / Engineer beyond the substantial and final visits due to the contractor’s failure to complete all listed deficiencies. Contractor will pay these additional visits to the Architect / Engineer whose time is involved at the rate of $75.00 per hour. This amount may be deducted from the project's final payment.

3.03 GUARANTEES AND CERTIFICATIONS

A. All work shall be guaranteed to be free from leaks, damage or defects. Any defective equipment, materials or workmanship shall be replaced or repaired at any time during the duration of the guarantee period.

B. Unless otherwise noted, all work shall be guaranteed for one year. Refer to other sections of the specifications for extended warranty requirements in items such as air conditioning compressors, water heaters, and others. The listed warranty time limits do not relieve the contractor’s or equipment supplier responsibility for any hidden latent installation or manufacturing defects that may appear at a later date.

C. The date of acceptance and start of all warranties and guaranties shall be established by the Owner and Architect through a formal notice to the Contractor. That date supersedes

any date or term limits that may be listed on any of the manufacturer's standard warranties. Also refer to General Provisions of the Specifications.

3.04 RECORD DRAWINGS

A. During the course of construction, the contractor shall keep at the site a set of mark-up prints indicating all deviations and changes from the work indicated on the contract drawings. Set shall be clearly labeled "RECORD DRAWINGS" and be available for review by Architect / Engineer.

B. Above information shall be used by the contractor to prepare one set of as-built reproducible drawings as a record of all construction revisions and changes from the contract drawings. Include all revisions to equipment schedules.

C. As indicated in Specifications Section 23 00 00, contractor shall keep a separate set of ductwork shop drawings indicating the duct sections, as they are pressure tested. Test and Balance technician shall initial and date drawings as duct sections are satisfactorily tested.

D. Upon completion of the work, and unless otherwise noted on the General and Supplementary Conditions of the Contract; and General Provisions of the Specifications, contractor shall furnish the Architect / Engineer a revised and final set of reproducible or electronic media CAD documents and a set of prints of the work as installed.

3.05 OPERATIONS AND MAINTENANCE MANUALS

A. Refer to Specifications General Provisions and Section 23 01 00.

3.06 OPERATING INSTRUCTIONS

A. Instruct representatives of Owner in operation and maintenance of all installed systems and equipment. Provide a minimum of two (2) working days of such instruction, more if required. Instruction period shall be video taped with copy of tape provided to the Owner.

B. Provide Maintenance Manual, see Specifications General Provisions and Section 23 02 00 and acquaint Owner's representative with its contents during instruction.

C. Furnish letter naming Owner's personnel receiving instruction and dates when instructions was given.

D. Provide, for each piece of equipment, the name, address and telephone number of the manufacturer's representative and Service Company, so that service or spare parts can be readily obtained.

END OF SECTION – 23 01 00

SECTION 23 08 00 – PAINTING AND IDENTIFICATION

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General and Supplementary Conditions of the Contract; General Provisions and of Section 23 00 00 shall apply to the Mechanical work shown on the drawings and specified under this Section.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work specified herein with that of other trades affecting or affected by work of this Division 23. Cooperate with those trades to assure steady progress of work under contract. Promptly notify Project Superintendent of any issues that may affect the work under this Division 23.

1.02 SCOPE OF WORK

A. All ductwork provided under Division 23, which is exposed to view, to the weather and/or as indicated on the drawings and specifications shall be painted unless otherwise noted.

B. All galvanized metals that are to be field painted shall be properly prepared to accept specified paint. If paint peels, repeat treatment and repaint at no cost to the contract.

C. Fans shall have factory standard finish. Field painting of equipment over standard finish shall be as directed by Engineer.

D. Apply primer ready to field painting, where required.

E. All unfinished ironwork installed under Division 23, which is exposed to view within the building or exposed to the weather, shall be painted as herein specified.

F. Provide permanent identification on equipment and piping systems. Coordinate with City of Tampa Wastewater Department the numbering sequence of equipment. City Standards take precedence over these specifications.

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

23 00 00 Mechanical General Requirements
23 70 00 Fans And Vents

1.04 SHOP DRAWINGS

A. Submit catalog data, color samples, and other requested data for following.

1. Paints

2. Treatment of galvanized metals

3. Markers

4. Labels

PART 2 - PRODUCTS

2.01 PAINT

A. Rust inhibitor paint shall be red chromate base made up in a synthetic resin vehicle.

B. Finish paint where specified shall meet the requirements of the City of Tampa Wastewater standards.

2.02 PAINT SCHEDULE

A. Painting schedule for equipment and piping:

Equipment and system components	Manufacturer's standard color and finish

B. Colors shall meet ANSI A13.1 Standard recommendations:

As selected by City of Tampa Wastewater Department

C. Color of letters applied to above colors shall be black on a yellow background.

PART 3 - EXECUTION

3.01 PAINTING GENERAL

A. Ironwork installed under this Division 23 of the Specifications exposed to view within the building, and not otherwise specified to be galvanized, stainless steel, copper or chrome plated, such as duct hangers, structural supports, supports for equipment, etc., shall be painted with one (1) coat of rust inhibiting paint. Finish paint, color as selected by City of Tampa Waste Water Department.

B. Ironwork installed under this Division 23 of the Specifications which is exposed to the weather, and not otherwise specified to be galvanized, stainless steel, copper or chrome plated, such as duct supports, etc., shall be painted with two (2) coats of rust inhibiting paint and one (1) coat of an acrylic base UV and mold resistant white paint. The Owner may select a different color of the finish paint.

C. Painted galvanized metals from which paint peels shall be stripped, retreated and repainted at no cost to the contract.

3.02 EQUIPMENT IDENTIFICATION

A. Identify each piece of equipment by its system number and other appropriate designation by stenciling in letters of approved size and wording. Equipment requiring identification shall include but not limited to: exhaust fans, control cabinets, starters and power disconnects, and others as directed by Engineer.

B. Identification numbers and names shown on the Contract Documents are for reference only. They shall be changed to meet Owner's numbering sequence and standards. Contractor shall request a copy of such standards.

C. Contractor shall mark record construction documents to reflect the labeling and numbering sequences when different from contract documents.

END OF SECTION – 23 08 00

SECTION 23 41 00 – CORROSION PROTECTION

Part 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General and Supplementary Conditions of the Contract; Specifications General Provisions and of Section 23 00 00 shall apply to the Mechanical work shown on the drawings and specified under this Section.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work specified herein with that of other trades affecting or affected by work of this Section. Cooperate with those trades to assure steady progress of work under contract. Promptly notify Project Superintendent of any issues that may affect the work under this Section.

1.02 SCOPE

A. The work under this section includes furnishing the labor, materials and equipment, and performing all operations necessary for the field application of coatings formulated for the protection against corrosion of the following equipment specified in this Section:

- Fans

B. Coatings shall completely cover and protect equipment components exposed to the weather.

C. For field applications, the applications contractor shall verify with the equipment manufacturer that the corrosion protection products he plans to use are compatible with the equipment. Include verification documentation with both equipment and corrosion protection materials shop drawing submittal.

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

23 00 00 Mechanical General Requirements
23 70 00 Fans and Vents

1.04 SHOP DRAWINGS

A. Provide for each product the following information:

Corrosion protection materials data sheets
Application procedures
Warranties

B. For additional Shop Drawing submission requirements refer to Specifications General Provisions and Section 23 00 00.

1.05 QUALITY ASSURANCE / WARRANTIES

A. Applicator Company shall be regularly and specifically engaged in the corrosion protection coatings business on a full-time basis. Company shall demonstrate technical capability and business longevity. Application staff shall be fulltime

employees of the Company.

B. The applicator staff shall be certified and trained in the application of the products they use and have a minimum of two (2)-years' full-time experiences doing this work.

C. Protective coatings shall carry five (5)-year unconditional warranties. Start of warranty is date of acceptance of project by the Owner. Include copy of Warranty in the Operations and Maintenance Manuals as per Specifications General Provisions.

D. Product submittal shall include a list of local references of work completed within the last five (5) years. Provide contact names and phone numbers.

E. Application shall be done in strict accordance with the instructions provided with the product(s). Copy of the instructions shall be provided with the shop drawings and one kept at the site.

F. For additional Quality Assurance requirements refer to Specifications General Provisions.

1.06 ACCEPTABLE FIELD APPLICATORS

A. Corrosion Solutions, Inc. and Blygold Florida Thermoguard.

B. Applicator's offices shall be located within a day's drive (maximum) from the job site.

C. Other applicators shall submit their qualifications, products and experience for review as per requirements of the General Conditions, Specifications Section 23 00 00 and this Section. City does not pre-approve substitutions before bid.

1.07 ACCEPTABLE PRODUCTS

A. Products shall be formulated for the Florida weather. Provide test data upon request.

B. Polyurethane based, Heresite, Electrofin or Blygold.

C. Other products shall be submitted for review as per requirements of the General Conditions, Specifications Sections 01, 23 00 00 and this Section.

D. Manufacturer's products used in this Section of the Specifications and application procedures are subject to change per manufacturer's action. Contractor shall therefore verify applicable information with manufacturer's representative before ordering any product or equipment. Notify Engineer of any changes and submit for their review information on new or replacement product. Changes shall be at no cost to the contract.

Part 2 - MATERIALS

2.01 GENERAL

A. Coatings to be applied under this Section of the Specifications shall be specifically formulated for finished products constructed with galvanized steel and aluminum.

B. The selected coating shall provide excellent resistance and durability against the corrosive effects of alkaloids, acids, alcohols, petroleum hydrocarbons, seawater, salt air and similar corrosive environments. Testing shall meet: ASTM G85-3000 hour's industrial environment; ASTM B117-10,000 hour's marine environment and Kesternich test-80 cycles fuel combustion (sulfuric environment).

2.02 APPLICATIONS OF CORROSION PROTECTION FOR AIR HANDLING EQUIPMENT (FANS) – FIELD APPLIED

A. Coatings shall be applied at the job site after all rigging and equipment handling has ended.

B. Fan(s) surfaces and other components shall be degreased cleaned and prepared for coating application. All rust shall be removed. Fan cabinets shall be brushed, rolled or sprayed with a corrosion and moisture resistant film for all surfaces (interior and exterior) to accomplish 4 - 8 mils of thickness. All exposed surfaces shall be coated. Coating shall be clear or gray and may not impede the natural coloration of the equipment manufacturer's finished product. All written information applied to the fans by the manufacturer shall remain legible and original. Fans shall then be left untouched for approximately 12-24 hours to permit curing of the product.

C. Acceptable Products and Manufacturers:

1. Cabinet coating process shall be similar and equal to Blygold Refamac, "OxiBloc II" process as supplied by OxiGuard, Inc., or Corrosion Solutions PC-2000.
2. Thermoguard-Polyurethane-based.

2.03 COATINGS

A. The coating shall be applicator standard product and provide a complete envelope protection against chemical and ultraviolet corrosion. All products shall contain anti-microbial additives.

B. Coating shall be effective on ferrous and non-ferrous metals, galvanized, anodized and painted surfaces.

C. Coating shall consist of an aluminum-impregnated polyurethane topcoat or an air dried phenolic material with corrosion resistant properties including ASTM Certification, tensile strength and flexibility to prevent fissures, stress cracks, peeling or flaking. Coating must achieve thickness as required.

2.04 PRIMER

A. Provide a combination primer/finish coat material similar to Blygold Florida "Rfamac" or Corrosion Solutions, Perfect-Coat PC-2000 Series.

2.05 THINNER

A. For all spray applications use a thinner similar to Blygold Florida or Corrosion Solutions' PC-2000-S.

2.06 CURING SCHEDULE

A. Specify curing time that reflects product mixture, ambient air temperature, as well as overall environmental conditions.

Part 3 - EXECUTION

3.01 SURFACE PREPARATION

A. Remove all manufacturing machine oil, grease, corrosion and/or dirt from surfaces with an appropriate solvent and/or detergent cleaner.

3.02 APPLICATION

A. Do not apply product if temperature is less than 5ºF (-15ºC) above dew point, or if temperature is below 45ºF (7ºC).

B. All spray equipment must be thoroughly cleaned and hosed, in particular, shall be free of old products and contaminants.

C. Standard manufacturer spray equipment may be used with proprietary accessories to achieve the performance of the spray application process.

D. Compressed air supplies must be uncontaminated. Air pressures must be adjusted relative to the gun manufacturer, unique accessories and variable nozzles.

E. Apply a trial application of mist for bonding and pattern features.

F. Apply several cross passes. Finished product should be 3 to 4 mils as a wet film thickness.

3.03 DAMAGE TO EQUIPMENT

A. Applicator is responsible for any damage to the equipment.

END OF SECTION – 23 41 00

SECTION 234200 – DIRECT EXPANSION (DX) MECHANICAL HVAC EQUIPMENT

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General Conditions, Supplementary General Conditions General Provisions and Specifications Section 23 00 00 are part of this Section.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate this work with that of other trades affecting or affected by work of this Section and cooperate with such trades to assure the steady progress of work under the contract.

1.02 SCOPE

A. Work under this section includes furnishing the labor, materials, equipment, and performing all operations necessary for the installation of DX heating, ventilating and air conditioning systems shown, detailed, and/or scheduled on the drawings, and/or specified in this section of the specifications.

B. Each DX split air conditioning system shall consist of one air handling unit and listed condensing unit(s), fully charged refrigerant piping and controls. When indicated and scheduled on the contract documents, air-handling units shall be provided with multiple condensing units. When multiple condensing units and/or compressors are provided, the evaporator coils shall be interlaced circuit construction.

C. Coordinate with contractor for general construction the concrete or precast pads required for the equipment specified under this Section. For equipment on the roof, coordinate the installation of roof curbs or other indicated support frames with roofing contractor.

D. All equipment exposed to the weather shall be anchored as required by the 2017 Florida Building Code.

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

23 00 00 Mechanical General Requirements
23 08 00 Painting and Identification
23 41 00 Corrosion Protection
23 70 00 Fans and Vents
23 95 00 Test and Balance

1.04 QUALITY ASSURANCE

A. Each piece of equipment shall have manufacturer's name, address, serial and model numbers engraved on a metal plate securely attached to it. Plastic labels glued to the unit are not acceptable unless a matching label is installed inside the access door to the electric panel section of the unit.

B. Capacities shall be not less than those indicated on plans.

C. Provide certified sound and/or fan data as hereinafter specified and upon request from the Architect / Engineer.

D. Each condensing unit and matching air-handling unit shall be the product of the same manufacturer and be ARI Certified.

E. All insulation used on equipment shall meet NFPA-90A flame spread and smoke generation requirements. Insulation exposed to the unit airflow shall have a coating applied at the factory or integral to the insulation. Double wall construction units are preferred and shall be provided when specified.

F. In each air-handling unit, the coil and filter sections shall be completely sealed to prevent air bypass around coil and filters.

G. The use of R-22 refrigerant is prohibited; provide information on refrigerant being used. Refrigerant must meet EPA and ASHRAE standards for ozone depletion and global warming.

H. For additional Quality Assurance requirements refer to Specifications General Provisions and Section 23 00 00.

1.05 SHOP DRAWINGS

A. Prepare and submit shop drawings for the following items whenever they are shown on the contract documents or herein specified.

Split System Air Handling Unit and Condensing Unit

B. For additional Shop Drawing submission requirements refer to Specifications General Provisions and Section 23 00 00.

PART 2 PRODUCTS

2.01 SPLIT SYSTEM AIR HANDLING UNITS

A. Provide draw-thru air handling unit(s) of size and capacities as shown on plans and as herein specified. Unit(s) to be UL listed.

B. The unit cabinet shall be constructed of galvanized steel. Finish paint shall be manufacturer standard color.

Cabinet shall have hinged access doors with locks for access to filters, electrical fan section and as required for the proper service of the equipment. Casing shall be reinforced, and braced steel supported on galvanized steel angles. Provide

minimum two (2) handles and locks per door, additional handles and locks shall be provided for doors over 24” high. If, due to unit size, hinged access door is not feasible, tool – less removal access panel shall be provided for those sections.

Cabinet removable panels shall provide access to filters, coil and fan section and as required for the proper service of the equipment. Casing shall be reinforced, and braced steel supported on galvanized steel angles.

C. Unit panels and doors shall be double wall construction. If, due to unit size, double wall construction is not feasible, and insulation must be exposed to airflow, it shall have a factory applied neoprene coating or be foil faced to prevent erosion. Construction shall be noted on shop drawings. Information shall be clearly noted in the shop drawings for the equipment.

D. Unit shall include a fan section, coil section, electric heater section and filter section. Provide sloped, insulated stainless steel condensate drain pan under the complete fan and coil section, including plenums. Drain pans shall meet current IAQ criteria and be sloped to retain minimum or no condensate during operation. If, due to unit size, stainless steel pan is not available, a composite drain pan shall be provided. Galvanized steel drain pans are not acceptable. Information shall be clearly noted in the shop drawings for the equipment.

E. Provide double width, double inlet centrifugal fans, statically and dynamically balanced and factory tested. Fan shall not pass through first critical speed before reaching RPM. Bearings shall be grease lubricated. Internal bearings shall have extended grease lines. The blower shall be equipped with a solid steel shaft. Fan wheels over 12 inches in diameter shall be keyed to the shaft.

F. Belt driven fans shall be provided with adjustable sheave on the motor to allow changes in the fan speed and an increase of up to 30% in the RPM's. Once unit performance is achieved, replace adjustable sheave with a fixed sheave as selected by the Test and Balance Agency.

G. Evaporator Coils

1. Evaporator coil(s) shall be removable and have continuous aluminum fins having collars, and seamless copper tubes mechanically expanded into the fins. Casing shall be stainless steel.

2. Refrigerant coils shall be circuited to meet capacities and provide full cold face area to air flow; split face coils are not acceptable. Coils shall be tested with dry air at 300-psig under water, be cleaned, dehydrated and charged with dry nitrogen before shipment.

H. Electric Heaters

1. Refer to equipment schedule for units to be furnished with factory installed electric heaters.

2. Provide low watt density (25W/SQ. IN. MAXIMUM) electric heaters of

capacities as scheduled on plans and herein specified. Heater(s) shall meet NFPA 70.

3. Coil(s) elements shall be 80% nickel, 20% chromium, insulated by floating ceramic bushings and supported in aluminized steel frames. Bushings shall be recessed into embossed openings and staked into supporting brackets. Stainless steel terminals shall be insulated with high temperature phenolic bushings.

4. All heaters shall be furnished with one, disc type, pilot duty and automatic reset thermal cutout for primary over temperature protection. Heaters shall be furnished with a disc type, load-carrying manual reset thermal cutout, factory wired in series with each heater stage for secondary protection. Heat limiters or other fusible over temperature protection devices are not acceptable.

5. Heaters shall be rated for the voltage, phase and number of heating stages indicated on the schedule. Three phase heaters shall have equal, balanced three phase stages. All internal wiring shall be suitable for 150^{o}C.

6. Heaters shall be supplied with their own controls including but not limited to thermal cutouts, de-energized magnetic contactors, built-in fuses, control circuit transformer with fused primary, and built-in type FRS or FRN fuses.

7. One set of thermal cutouts, de-energizing switch contactors and built-in fuses per stage shall be supplied if the heater load exceeds 48 amps. Fuse blocks shall include supplemental wire tension springs.

8. Heaters shall be supplied with the following factory built-in features:

   Airflow Switch
   Inlet Perforated Metal Pressure Plate

9. Heaters line terminal blocks shall be sized to handle 125% of the total heater load.

10. Heaters are to be listed by Underwriter's Laboratories (UL) and meet the requirements of the National Electrical Code. UL listing shall allow installation with zero clearance to combustible surfaces. UL labels shall be of the metal type installed in a visible location and permanently attached to heater frame.

11. When heaters are to be installed at the fan discharge, external to the unit cabinet, they shall be specifically designed for that application.

I. Provide filter box containing indicated filters. Boxes shall have hinged access doors on both sides and inlet flanges. Filters shall fit together to prevent air bypass, provide filler sections if required. Provide metal frames for 2" and 4” thick pleated filters, MERV 8 and MERV 11 efficiency.

1. Refer to equipment schedule for units to be furnished with higher efficiency filters in addition to the 2” pleated filters.

J. Small units, 5 tons and under when installed in the vertical position shall be provided with a support frame minimum 2 ft high. Frame shall be hot dipped galvanized steel.

K. Provide, for each system, a programmable thermostat with capabilities such as seven (7) day time schedule, night set back, cool/off/heat selection fan/off/auto selection, and other features as may be required by the building use. Refer to sequence of operations on drawings. When indicated, provide a remote sensor to be installed in the return air duct.

L. Acceptable manufacturers are: Carrier, York-Johnson Controls, Trane and McQuay-Daikin. For basis of design refer to schedule on the contract documents.

2.02 AIR COOLED CONDENSING UNIT

A. Furnish and install air cooled condensing unit(s) of size and capacity as shown on plans and as herein specified. Unit(s) shall be by the same manufacturer as the air-handling unit. Mixing of manufacturers is prohibited.

B. Unit shall have as its main components, condenser coils with integral sub cooling, condenser fan(s) and motor(s) and manufacturer’s standard compressor for the specified unit size, unit controls, and a holding charge of refrigerant all designed for outdoor installation. Provide standard manufacturer low ambient protection and controls for outdoor temperature operation down to 0ºF.

C. Casings shall be galvanized steel. Interior surface phosphatized, painted with epoxy primer and finished with baked-on enamel manufacturers standard finish. Supporting legs, fan and motor base and motor mount shall be hot deep galvanized steel.

D. Condenser fans and drives: Axial flow fans with permanently lubricated ball bearings direct or V-belt drives powered by weatherproof, permanently lubricated ball bearing high efficiency heavy duty motors with built-in thermal overload protection. Zinc plated fans with manufacturer’s standard finish. Fans shall be protected with removable wire guard. Wire guard shall have manufacturer’s standard corrosion protection.

E. Condensing coils for systems 7.5 Ton and larger shall be seamless copper tubing with heavy-duty aluminum fins mechanically bonded to the tubes. Coil frame shall be galvanized steel. Provide removable access panels.

1. All aluminum coils can only be used when a request for approval has been submitted prior to bid and a written Addendum has been issued.

F. Coils shall be pressure tested at the factory with 320-psig air pressure under water; cleaned, vacuum, dehydrated and leak tested at 150 psig. Units shall

have a sub-cooling circuit.

G. Compressor(s) shall be manufacturer's standard type for the specified unit model and size, 1750 rpm designed for refrigerant 410a. Blended, EPA approved replacement refrigerants are acceptable and are preferred provided proper information is submitted with equipment shop drawings. Complete compressor unit shall be mounted on galvanized steel base.

1. Foam breaker, spring-loaded cylinder heads and non-flexing ring plate valves with large gas passages and minimum clearance volume.

2. Compressors to be enclosed in a sound attenuating compartment and mounted on rubber-in-shear pads or spring isolators.

3. Compressor motor shall be suitable for voltage fluctuations plus or minus 15 percent of nameplate voltage and have two thermostats located directly in the motor winding.

H. Provide a 24-volt electrical control system.

I. Provide expanded galvanized metal grilles to protect all exposed condenser coils.

J. Provide hot gas bypass for systems operating in the cooling mode during light loading conditions or low ambient temperatures.

K. All units to have manufacturer's five-year compressor parts warranty. Warranties to start on day of acceptance of project by the Owner. Units shall be ETL or UL approved and listed. Installation and maintenance manuals shall be supplied with each unit.

L. When indicated, unit(s) to be given a corrosion protection coating as per Specifications Section 23 41 00.

M. Acceptable manufacturers are: York-Johnson Controls, Carrier, McQuay-Daiken and Trane.

PART 3 EXECUTION

3.01 EXAMINATION OF FIELD CONDITIONS

A. Contractor shall verify that spaces are ready to receive work. Coordinate with other trades working in the same area.

B. Units shall be installed level, with trapping provided in accordance with manufacturer's requirements. Visually inspect to ensure proper drainage of condensate.

C. Verify that required utilities are available, in proper location accessible and ready for use.

D. Beginning of installation means installer accepts existing conditions.

3.02 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be delivered to the site in manufacturer's original packaging each clearly marked with the proper identification number.

B. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

C. Units shall ship fully assembled up to practical shipping and rigging limitations. Units not shipped fully assembled shall have tags on each section to indicate location and orientation in direction of airflow. Each section shall have lifting lugs to allow for field rigging and final placement of section.

D. Delivered units shall have fan motors, sheaves and belts completely assembled and mounted in units. If these components are not completely assembled, contractor shall coordinate with the equipment supplier the installation, testing and vibration balancing of fan(s).

E. Store units in a clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures and finish. Store in accordance with the requirements of Specifications General Provisions and Section 23 00 00.

3.03 INSTALLATION

A. Each piece of equipment shall be installed in accordance with the approved recommendations of the manufacturer to conform to the contract documents.

B. Each piece of equipment shall be installed to be free of noise and vibration. Provide isolators as per manufacturer's recommendations and/or as herein specified.

C. Provide factory approved/trained supervision during start-up of equipment.

D. Provide extended four-year guarantee for all compressors (total 5 years).

E. Provide extended lubrication tubes and fittings for service of bearings located in concealed or difficult to reach sections of apparatus. Provide additional extensions as directed by Architect / Engineer.

F. Duct turns located near a fan discharge shall always be in the direction of fan rotation. Equipment installer shall coordinate arrangement of fan section to assure this condition is met.

G. For condensing units installed at ground level, provide a poured in place or precast reinforced concrete pad. Top of pad(s) shall be not less than 6" above surrounding grade and shall extend a minimum of two feet beyond the equipment in all directions, more if necessary to provide for equipment service as recommended by the equipment manufacturer. Secure equipment to pad(s) as

required by code to meet wind loads. Install a minimum 1” thick neoprene or rubber pad at each condensing unit weight support point.

H. Condensing units shall be installed free of enclosures that prevent air circulation. When enclosures are provided, installer shall verify that the clearances for airflow and service access around the equipment meet those recommended by the equipment manufacturer. Notify Architect / Engineer of any conflicts.

I. Air handling units shall be installed on a six-inch (6”) concrete pad. Pad shall extend a minimum of one foot (1 Ft.) beyond the equipment in all directions.

3.04 EQUIPMENT PERFORMANCE

A. Performance indicated on schedule(s) is based on the listed equipment manufacturer used as the basis of design. For all other acceptable manufacturers, shop drawing data shall indicate equal or better performance characteristics than the specified equipment.

B. Once unit airside performance is achieved, replace adjustable sheave with a fixed sheave as selected by the Test and Balance Agency. Replacement shall be done at no cost to the contract. Include information in the Test and Balance Report and the Operations and Maintenance Manual.

3.05 EQUIPMENT SERVICE

A. Provide clearances around equipment as required by Code and the equipment manufacturer for the proper maintenance or removal of equipment.

B. Coordinate with other trades so no conduit, pipes; ceiling hangers, etc. interfere with the required clearances.

C. Notify contractor for general construction when uncoordinated work installed by other trades needs to be relocated.

3.06 CORROSION PROTECTION

A. Condensing units shall have field applied corrosion protection coating as indicated in Specifications Section 23 41 00.

END OF SECTION – 23 42 00

SECTION 23 70 00 – FANS AND VENTS

Part 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General and Supplementary Conditions of the Contract; General Provisions and of Section 23 00 00 shall apply to the Mechanical work shown on the drawings and specified under this Section.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate this work with that of other trades affecting or affected by work of this Section and cooperate with such trades to assure the steady progress of work under the contract.

1.02 SCOPE

A. The work under this section includes furnishing the labor, materials, tools, appliances, equipment, and performing all operations necessary for the complete installation of fans shown and scheduled on the Contract Documents.

B. The following fan types are part of this project:

1. In-line cabinet fans

2. Utility fans

1.03 RELATED DOCUMENTS

A. The following sections of the specifications are included hereinafter:

23 00 00	Mechanical General Requirements
23 41 00	Corrosion Protection
23 95 00	Test and Balance

1.04 QUALITY ASSURANCE

A. Each fan shall have manufacturer's name, address, serial and model numbers engraved on a metal plate securely attached to the equipment.

B. Capacities shall be not less than those indicated on the Contract Documents.

C. Provide certified sound and/or fan data as hereinafter specified and upon request from the Engineer.

1. Wall mounted equipment shall be provided with supports suitable for wall construction. When fan or its accessories installation requires penetration of outside wall, it shall include necessary caulking, etc. to prevent water intrusion. Coordination location of wall openings with project superintendent.

D. For additional Quality Assurance requirements refer to Specifications General Provisions.

1.05 SHOP DRAWINGS

A. Prepare and submit shop drawings for the following items whenever they are

shown on the Contract Documents or herein specified.

In-Line Fans
Utility Fans
Power Roof Exhaust Fans

B. For additional Shop Drawing submission requirements refer to Specifications General Provisions and Section 23 00 00.

Part 2 - PRODUCTS

2.01 IN-LINE FANS

A. Furnish and install duct mounted, belt driven centrifugal inline fans as herein specified and shown on contract documents.

B. Certifications: Fan shall be manufactured at an ISO 9001 certified facility. Fan shall be listed by Underwriters Laboratories (UL 705) and UL listed for Canada (cUL 705). Fan shall bear the AMCA certified ratings seal for sound and air performance.

C. The fan shall be of bolted construction utilizing corrosion resistant fasteners. Housing shall be minimum 18-gauge galvanized steel with integral duct collars. Bolted access doors shall be provided on three sides, sealed with closed cell neoprene gaskets. Pivoting motor plate shall utilize threaded L-bolt design for positive belt tensioning. Housing shall be pre-drilled to accommodate universal mounting feet for vertical or horizontal installation. Unit shall bear an engraved aluminum nameplate. Nameplate shall indicate design CFM, static pressure, and maximum fan RPM. Unit shall be shipped in ISTA certified transit tested packaging.

D. Wheel shall be centrifugal backward inclined, constructed of 100% aluminum, including a precision machined cast aluminum hub. Wheel inlet shall overlap an aerodynamic aluminum inlet cone to provide maximum performance and efficiency. Wheel shall be balanced in accordance with AMCA Standard 204-05, *Balance Quality and Vibration Levels for Fans.*

E. Motor shall be NEMA design B with class B insulation rated for continuous duty and furnished at the specified voltage, phase and enclosure.

F. Bearings shall be designed and individually tested specifically for use in air handling applications. Construction shall be heavy duty greasable ball type in a pillow block cast iron housing selected for a minimum L50 life in excess of 200,000 hours at maximum cataloged operating speed.

G. Belts shall be oil and heat resistant, static conducting. Drives shall be precision machined cast iron type, keyed and securely attached to the wheel and motor shafts. Drives shall be sized for 150% of the installed motor horsepower. The variable pitch motor drive must be factory set to the specified fan RPM.

H. Basis of design fan is a model SQN-B as manufactured by Loren Cook Company of Springfield, Missouri. Acceptable similar fan as manufactured by Greenheck.

2.02 UTILITY FANS

A. Furnish and install belt driven utility fans as specified herein and scheduled on the Contract Documents. Utility fans shall be single width, single inlet.

B. The housing shall be constructed of heavy gauge galvanized steel with lock formed seams permitting no air leakage. The housing construction shall allow for the fan to be rotated in the field to any of the eight standard discharge positions. Housing and bearing supports shall be constructed of welded heavy gauge galvanized steel members to prevent vibration and rigidly support the motor and wheel assemblies.

C. The fan wheel of direct drive fans shall be of the forward curved type and shall be constructed of heavy gauge aluminum with uniform stamped blades. The fan wheel of belt drive fans shall be of the non-overloading backward inclined, centrifugal fan type and constructed of heavy gauge steel. Wheels shall be statically and dynamically balanced at the factory. The wheel cone and fan inlet cone shall be matched for maximum performance and operating efficiency.

D. Motors shall be permanently lubricated, heavy-duty high efficiency ball bearing type matched to the fan load and furnished at the voltage, phase and enclosure shown on the fan schedule.

E. The fan shaft shall be ground, and polished solid steel mounted in heavy duty, permanently sealed, pillow block ball bearings. Bearings shall be selected for a minimum L50 life in excess of 200,000 hours at maximum cataloged operating speed. Drives shall be sized for a minimum of 150% of driven horsepower. Pulleys shall be of the fully machined cast iron type, keyed and securely attached to the wheel and motor shafts. The motor pulley shall be adjustable for final system balancing.

F. Fan performance shall be based on tests conducted in accordance with AMCA Standard 210 test code for air moving devices, and fans shall be licensed to bear the AMCA Certified Ratings Seal for air performance.

G. Fans shall be provided with provided with weather protection covers for exposed outdoor installation.

H. Belt Drive utility fans shall be Model SFB with forward curved wheels as manufactured by Greenheck and Cook.

2.03 POWER ROOF EXHAUST FAN

A. Furnish and install power roof exhaust fan of size and capacity as shown on plans and as herein specified.

B. Fan type shall be centrifugal wheel, belt or direct drive as scheduled, statically and dynamically balanced. Fan shall have AMCA certified rating seal.

C. Fan housings shall be weatherproof of heavy gauge aluminum construction.

D. Fan motor shall be supported on vibration isolating mounts. Belt driven fans shall be provided with adjustable sheave on the motor to allow changes in the fan speed and an increase of up to 30% in the RPM's.

E. Direct driven fan(s) shall be provided with unit mounted adjustable solid-state speed control. Fan(s) shall be selected to deliver specified CFM with the solid-state speed control set at 70% of its operating range.

F. Each fan shall be equipped with the following accessories:

1. A back-draft damper installed in the curb of the fan.

2. A minimum 12 inches high pre-fabricated roof curb shall be furnished with the fan

and match unit furnished. Installer shall verify requirements based on roof construction to assure top of curb is at least 10 inches above finished roof surface. Refer to Architectural and Structural Roof Plans.

3. Provide bird screen and disconnect switch.

4. For additional accessories and controls refer to schedule on the Contract Documents.

G. Acceptable manufacturers are: Greenheck and Cook.

Part 3 - EXECUTION

3.01 INSTALLATION

A. Each fan shall be installed in accordance with the approved recommendations of the manufacturer and conform to the requirements of the Contract Documents.

B. Fans shall be installed free of noise and vibration. Provide isolators as per manufacturer's recommendations.

C. Fans suspended from the building structure shall be provided with the required restraints to prevent swaying or lateral movement during start up and normal operation. Submit installation details with fans shop drawings.

D. Deliver equipment to the site in manufacturer's original packaging. Clearly mark each piece of equipment with the proper identification number. Storage shall be done in accordance with the requirements of Specifications General Provisions and Section 23 00 00.

E. Provide extended lubrication tubes and fittings for service of bearings located in difficult to reach sections of the equipment. Provide additional extensions as directed by Engineer or the Owner.

F. Duct elbows located near the fan discharge shall always be in the direction of fan rotation. Equipment installer shall coordinate arrangement of fan section to assure this condition is met. Inlet duct connections shall be free of turbulence.

G. Air moving equipment shall be joined to duct sections with a 30 oz. neoprene coated, glass fiber flexible connector.

3.03 EQUIPMENT PERFORMANCE

A. Performance indicated on schedule(s) is based on the listed equipment manufacturer used as the basis of design. For all other acceptable manufacturers, shop drawing data shall indicate equal or better performance characteristics than the basis of design equipment.

B. Once unit airside performance is achieved, replace adjustable sheave with a fixed sheave as selected by the Test and Balance Agency. Replacement shall be done at no cost to the contract. Include information in the Test and Balance Report and the Operations and Maintenance Manual.

3.04 TEST AND BALANCE

A. Test and Balance Agency shall adjust fan belts and test and record equipment performance. Refer to Specifications Section 23 95 00.

B. Test and Balance Agency shall select replacement fixed sheave for belt driven fans once unit airside performance is achieved.

3.05 EQUIPMENT SERVICE

A. Provide clearances around equipment as required by Code and equipment manufacturer for the proper maintenance or removal of equipment.

B. Coordinate with other trades so no conduit interfere with the required clearances.

C. Notify contractor for general construction when in order to install this equipment work by other trades needs to be relocated.

3.06 IDENTIFICATION

A. Each piece of equipment shall be identified as per Specifications Section 23 08 00 with a permanently engraved plastic plate securely attached to equipment. Identification numbers shall be as directed by the City of Tampa Wastewater Department Project Manager.

3.07 CORROSION PROTECTION

A. All fans specified under this section of the specifications shall have a corrosion protection coating applied as per Specifications Section 23 41 00.

END OF SECTION – 23 70 00

SECTION 23 95 00 – TEST AND BALANCE

Part 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The requirements of the General and Supplementary Conditions of the Contract; General Provisions and of Section 23 00 00 shall apply to the Mechanical work shown on the drawings and specified under this Section.

B. Examine other Sections of the Specifications and the Contract Documents for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate this work with that of other trades affecting or affected by work of this Section and cooperate with such trades to assure the steady progress of work under the contract.

1.02 SCOPE

A. The contractor shall procure the services of a local, independent Test and Balance Agency, hereinafter referred to as the Agency, approved by the Engineer, which specializes in the testing and balancing of heating, ventilating, and air conditioning systems.

B. The Agency shall test, balance and adjust all air systems and temperature control equipment specified in this Division 23 of the Specifications.

C. The Contractor shall award the test and balance contract to the Agency as soon as possible to allow them to schedule their work in cooperation with other trades and meet the completion date.

D. The Agency shall test each Sequence of Operation for all systems to verify proper operation. Include description of operation in report, verify that all controls are installed and operating in accordance with the control Sequence of Operation on plans or on equipment submittals.

E. Submit a certified Test and Balance Report to the Engineer at least one week prior to the scheduled Substantial Completion. Refer to Specifications General Provisions. If the report is not available, the Substantial Completion may be re-scheduled.

1.03 RELATED DOCUMENTS

A. Work covered under other sections of the specifications related to testing and balancing includes but is not limited to the following:

23 00 00	Mechanical General Requirements
23 70 00	Fans and Vents

B. Work performed under the above sections is herein referred to as the Installer. Refer to specific items of work provided by each Installer. Installers shall cooperate with test and balance agency as required during execution of the work under this Section.

C. Prior to commencing the work under this Section, The Agency staff shall visit the construction site to review the work specified under the above listed Sections as it relates to work under this Section. Any deviations from plans and specifications that may affect the performance of the system(s) shall be reported to the

Engineer and Contractor.

1.04 QUALITY ASSURANCE

A. Contractor shall list in his bid the name of the local Agency he proposes to use for the project. Agency is subject to acceptance by Engineer. Submit qualifications of Test and Balance Agency to Engineer for review and approval. Submission shall be forwarded as soon as contractor is selected. Once accepted, contractor, without good cause, cannot replace Test and Balance Agency.

B. All instruments used for test and balance shall be accurately calibrated within six months of commencing work on this project and maintained in good working order. Provide proof of calibration upon request.

C. Submit qualifications of Test and Balance Agency to Engineer for review and approval. Submit proposed test and balance procedures, list of equipment to be used and any other information that will allow the Engineer to properly evaluate Agency's capabilities as related to the Project.

D. All readings shall be within +10% / -5% of the values shown on the plans and specifications, shop drawings and manufacturer's literature. Readings for outside airflow shall be within –5% - 0% of the values shown on the plans. These allowances do not relieve the Agency from adjusting speed controllers, belts and other control devices to achieve design conditions.

E. Prior to commencing its work, the Test and Balance Agency shall meet with the contractor and installers to review and obtain copies of the **latest** construction documents, addenda, shop drawings, change orders, field changes and any other information necessary for their thorough and complete understanding of the scope of the project. If required information is not readily available from the Contractor, Agency may request that information directly from the Engineer. Contractor shall be responsible for all reproduction costs.

F. The Agency shall be represented at the time of substantial completion for a random check of the values contained in the test and balance report. If report values cannot be verified, Agency shall re-test the entire system, prepare a new report and submit to the Engineer.

G. Project will not be considered substantially complete until Test and Balance Report can be reviewed and verified.

H. For additional Quality Assurance requirements refer to Specifications General Provisions and Section 23 00 00.

1.05 WARRANTY

A. During the first year after completion of test and balance work, the owner may request a recheck or resetting of any outlet, supply fan, or exhaust fan listed in the test and balance report.

1.06 REPORTS

A. At the end of each workday, the Agency technician shall furnish the Contractor with a list of items that must be repaired or adjusted. Provide a copy to the Engineer.

B. Test and Balance information shall be compiled in a neat, orderly, itemized format on standard AABC or NEBB Forms. Test data shall be submitted to the Engineer for review. Provide minimum of three (3) hard copies of the report for Engineer’s

review. When electronic copies are submitted, they shall be in PDF format. For large reports, a readable CD or DVD will be required.

C. After review comments are satisfied furnish the Engineer three (3) final sets of the complete final report. A report is deemed to be final when all outstanding items listed on previous reports have been corrected and are no longer listed on the report.

D. Included in the report shall be the following minimum information. Identify each piece of equipment with project tag number, model number and serial number. Serial number on exhaust fans may be omitted.

1. Air quantities at each exhaust air device tabulated against CFM shown on the Drawings.

2. Static pressure readings entering and leaving each exhaust fan. These readings shall be related to fan curves for CFM handled.

3. Motor current readings at each fan. The voltage at the time of readings shall be listed.

4. Test controls and Sequence of Operations of equipment.

5. Provide calculations and recommended fixed sheave selection for each fan where adjustable sheaves were used for test and balance. Contractor shall install fixed sheaves.

E. Submit three (3) bound copies of the final complete Test and Balance Report one week prior to substantial completion. Electronic copies are <u>not</u> acceptable other than for progress review of data. Failure to comply with this request may result in a postponement of the Substantial Completion Inspection.

1.07 COORDINATION WITH CONTRACTOR AND INSTALLERS

A. The Agency staff shall visit the construction site to review and become familiar with the installation of pipe systems, sheet metal work, temperature controls and other components and parts of the heating, air conditioning, and ventilating systems. Verify that adequate provisions have been made for the testing and balancing of the systems and equipment.

B. The Agency will not instruct or direct the Contractor in any work but will provide him with daily reports of his findings with copy to the Engineer.

C. The Contract Documents indicate dampers and miscellaneous flow adjustment devices for the purpose of obtaining optimum operating conditions. When additional dampers are required by the Agency to achieve design airflows, the contractor, at no additional cost to the contract, shall provide them. It will be the responsibility of the Contractor to install these devices in a manner that leaves them accessible and adjustable. The Agency should be consulted if there are any questions concerning the arrangement and access to any control devices.

D. The controls installer shall initially set, adjust, relocate (if necessary), and calibrate all controls. The Agency shall verify proper operation of controls. Include in the report one week prior to the Substantial Completion a statement that all controls have been tested for proper operation in accordance with the Sequence of Operation and design intent.

E. Contractor to install fixed sheaves on air handling equipment as recommended by Test and Balance Agency.

Part 2 - PRODUCTS

NOT APPLICABLE

Part 3 - EXECUTION

3.01 GENERAL

A. Installer of mechanical systems shall make all preliminary tests and adjustments, place all systems and equipment in full operation and promptly notify the Test and Balance Agency to start their work. Installer shall maintain all systems in operation during each working day of testing and balancing.

B. Installer shall promptly correct all deficiencies noted by the Agency so as not to delay the completion of the test and balance work.

C. It shall be the responsibility of the Contractor to replace fan drives, sheaves, belts and/or motors as recommended by the Agency (without cost to the contract) to attain the specified air volumes.

END OF SECTION – 23 95 00

SCOPE OF WORK

THE WORK CONSISTS OF FURNISHING ALL LABOR, MATERIALS, EQUIPMENT, TRANSPORTATION, AND PERFORMING ALL OPERATIONS REQUIRED TO SUPPORT THE INSTALLATION AND COMMISSIONING OF THE ELECTRICAL PORTION OF THE CITY OF TAMPA'S LOUISIANA PUMP STATION REHABILITATION. THE WORK INCLUDES, BUT IS NOT LIMITED TO, THE FOLLOWING:

1. SUBMIT WORKING DRAWINGS, PARTS SCHEDULES AND CUT–SHEETS TO THE ENGINEER.

2. FURNISH AND INSTALL ALL EQUIPMENT, CONTROLS AND INSTRUMENTATION AS SHOWN ON THE PLANS AND DESCRIBED IN THE SPECIFICATIONS.

SPECIFICALLY:

A. FURNISH ALL LABOR, MATERIALS, EQUIPMENT AND INCIDENTALS REQUIRED FOR THE CITY OF TAMPA'S LOUISIANA AVENUE PUMP STATION IMPROVEMENTS AS HEREINAFTER SPECIFIED AND SHOWN ON THE DRAWINGS. THE WORK INCLUDES, BUT IS NOT LIMITED TO, THE FOLLOWING:

1. REMOVE THE EXISTING 480V PUMP STATION ELECTRICAL SERVICE FEEDERS BACK TO THE BASE OF THE EXISTING TAMPA ELECTRIC COMPANY (TECO) POWER DISTRIBUTION POLES. ALL WORK SHALL BE COORDINATED WITH TECO.

2. PROVIDE AND INSTALL NEW 480V PUMP STATION ELECTRICAL SERVICE FEEDERS FROM THE BASE OF THE EXISTING TAMPA ELECTRIC COMPANY (TECO) POWER DISTRIBUTION POLES TO THE NEW SERVICE ENTRANCE SWITCHGEAR TO BE PROVIDED. ALL WORK SHALL BE COORDINATED WITH TECO.

3. DEMOLISH AND REMOVE THE EXISTING CURRENT TRANSFORMER (C.T.) METER ASSOCIATED WITH THE EXISTING SERVICE.

4. DEMOLISH AND REMOVE THE EXISTING 480V, 600A, SERVICE ENTRANCE DISCONNECT SWITCHES LOCATED IN THE EXISTING SERVICE ENTRANCE ROOM.

5. THE CONTRACTOR SHALL CAREFULLY REMOVE THE EXISTING TRANSFER SWITCH LOCATED IN THE EXISTING SERVICE ENTRANCE ROOM AND TURN OVER TO THE CITY OF TAMPA FOR MAINTENANCE INVENTORY.

6. DEMOLISH AND REMOVE THE EXISTING MOTOR CONTROL CENTER (MCC). THE CONTRACTOR SHALL CAREFULLY REMOVE THE EXISTING ADJUSTABLE FREQUENCY DRIVE (AFD) FOR PUMP #3 AND ALL MOTOR STARTERS. THE AFD AND MOTOR STARTERS SHALL BE TURNED OVER TO THE CITY OF TAMPA FOR MAINTENANCE INVENTORY.

7. DEMOLISH AND REMOVE THE EXISTING LIGHTING FIXTURES AND SWITCHES AS INDICATED ON THE DRAWINGS.

8. DEMOLISH AND REMOVE THE EXISTING 480V CAPACITOR BANKS, LOCATED ON THE LOWER LEVEL OF THE PUMP STATION, AS INDICATED ON THE DRAWINGS.

9. DEMOLISH AND REMOVE THE EXISTING 480V MOTOR STARTERS AND DISCONNECTS, LOCATED ON THE LOWER LEVEL OF THE PUMP STATION, AS INDICATED ON THE DRAWINGS.

10. PROVIDE AND INSTALL THE NEW SERVICE ENTRANCE SWITCHGEAR, DESIGNATED 'SWITCHBOARD LPS', AS INDICATED ON THE DRAWINGS.

11. PROVIDE AND INSTALL THE NEW MOTOR CONTROL CENTER, DESIGNATED 'MCC–1', AS INDICATED ON THE DRAWINGS.

12. PROVIDE AND INSTALL THE NEW ADJUSTABLE FREQUENCY DRIVES, DESIGNATED AS 'AFD–P1', 'AFD–P2' AND 'AFD–P3', AS INDICATED ON THE DRAWINGS.

13. PROVIDE AND INSTALL THE NEW STANDBY GENERATOR SETS, DESIGNATED AS 'G–1' AND 'G–2', AS INDICATED ON THE DRAWINGS.

14. THE EXISTING MOSCAD CABINET, LOCATED IN THE UPPER LEVEL EQUIPMENT ROOM, CONTAINS AN EXISTING MOSCAD–L UNIT, A MOTOROLA RADIUS CM 200 RADIO, A BRIGHTHOUSE CABLE MODEM, A LINKSYS RV042 VPN ROUTER, A UPS, A BATTERY AND A 24V DC POWER SUPPLY. THE CONTRACTOR SHALL CAREFULLY REMOVE THE COMPONENTS. WHILE THESE COMPONENTS ARE TO BE REPLACED, THE CONTRACTOR MAY UTILIZE THE EXISTING EQUIPMENT TO PROVIDE TEMPORARY RADIO COMMUNICATIONS DURING CONSTRUCTION. THE LOUISIANA PUMP STATION'S EXISTING MOSCAD EQUIPMENT SERVES AS THE STORE AND FORWARD POINT FOR MORE THAN THIRTY (30) EXISTING PUMP STATIONS. THEREFORE, THE REQUIRED EQUIPMENT SHALL BE TEMPORARY RELOCATED AND BE KEPT FREE FROM MOISTURE AND EXCESSIVE HEAT DURING CONSTRUCTION. THE CONTRACTOR SHALL SUBMIT A PLAN FOR REVIEW AND APPROVAL TO KEEP THE MOSCAD RADIO SYSTEM OPERATIONAL DURING ALL PHASES OF CONSTRUCTION. THIS PLAN SHALL INCLUDE THE SEQUENCE OF WORK TO BE PERFORMED, A LIST OF ALL TEMPORARY EQUIPMENT TO BE SUPPLIED, THE TEMPORARY EQUIPMENT'S RATING AND SPECIFICATIONS, THE PROPOSED TEMPORARY LOCATION OF THE EQUIPMENT AND THE PLAN SHALL IDENTIFY THE SPECIFIC STEPS TO BE TAKEN TO PROTECT THE EQUIPMENT FROM MOISTURE AND EXCESSIVE HEAT. THE PLAN SHALL INCORPORATE THE USE OF THE PUMP STATION'S EXISTING ANTENNA, AS WELL AS, INCORPORATE THE PUMP STATION'S EXISTING IP NETWORK AS THE SECONDARY BACKUP. THE CONTRACTOR SHALL COORDINATE ALL REQUIRED SCADA OUTAGES/WORK WITH THE CITY OF TAMPA. PRIOR TO ANY OUTAGE, THE CONTRACTOR SHALL SUBMIT A WRITTEN REQUEST TO THE CITY OF TAMPA. THE REQUEST SHALL DETAIL THE NATURE OF THE OUTAGE, ALL EQUIPMENT AFFECTED BY THE OUTAGE, THE AMOUNT OF TIME REQUIRED FOR THE OUTAGE AND A CONTINGENCY PLAN FOR THE OUTAGE. THE OUTAGE REQUEST SHALL BE SUBMITTED TO THE CITY A MINIMUM OF 2 WEEKS PRIOR TO THE DATE OF THE REQUESTED OUTAGE. THE CONTRACTOR SHALL NOT BE ALLOWED TO INITIATE THE OUTAGE PRIOR TO RECEIVING WRITTEN APPROVAL FROM THE CITY OF TAMPA.

15. THE CONTRACTOR SHALL PROVIDE AND INSTALL A NEW SCADA CONTROL PANEL TO BE DESIGNATED 'CP–L01'.

16. THE EXISTING BUBBLER/PUMP CONTROL CABINET, LOCATED ON THE UPPER LEVEL OF THE PUMP STATION, SHALL BE REWORKED AS INDICATED ON THE DRAWINGS. THE NEWLY REWORKED CABINET SHALL SERVE AS THE STATION'S BUBBLER PANEL AND SHALL BE DESIGNATED 'BP–L01'

17. THE EXISTING SCADA CABINET, LOCATED ON THE UPPER LEVEL OF THE PUMP STATION, SHALL BE REWORKED AS INDICATED ON THE DRAWINGS. THE NEWLY REWORKED CABINET SHALL SERVE AS THE STATION'S PUMP CONTROL PANEL AND SHALL BE DESIGNATED 'CP–L02'.

18. PROVIDE AND INSTALL NEW LIGHTING FIXTURES, SWITCHES AND LIGHTING CONTROLS AS INDICATED ON THE DRAWINGS.

19. PROVIDE AND INSTALL NEW 120V RECEPTACLES AS INDICATED ON THE DRAWINGS.

20. DEMOLISH AND REPLACE MISCELLANEOUS CONDUCTORS/CONDUITS AS INDICATED ON THE DRAWINGS.

21. THE CONTRACTOR SHALL COORDINATE ALL SITE, ELECTRICAL WORK, CONTROLS WORK, TEMPORARY CONSTRUCTION POWER, TEMPORARY CONTROL SYSTEMS, AND ALL BYPASS SYSTEMS REQUIRED WITH CITY OF TAMPA STAFF AND THE MECHANICAL CONTRACTOR TO ALLOW FOR UNINTERRUPTED PUMP STATION OPERATION DURING CONSTRUCTION.

a. THE CONTRACTOR SHALL PROVIDE ALL TEMPORARY POWER TO THE FACILITIES REQUIRED DURING CONSTRUCTION. THE CONTRACTOR MAY RENT THE STANDBY POWER ENGINE/GENERATOR SETS REQUIRED OR USE EQUIPMENT FROM HIS/HER INVENTORY. THE CONTRACTOR SHALL COORDINATE THE TEMPORARY POWER REQUIREMENTS WITH THE MECHANICAL CONTRACTOR, AS DIESEL DRIVEN PUMP SET(S) MAY ALSO BE UTILIZED TO ACCOMMODATE A PORTION OF THE PUMPING REQUIREMENTS.

b. THE CONTRACTOR SHALL ALSO SUPPLY AND INSTALL ANY AND ALL CIRCUIT BREAKER PANELBOARDS, COMBINATION STARTERS, ADJUSTABLE FREQUENCY DRIVES, CABLING, ETC. THAT MAY BE REQUIRED TO FACILITATE THE TEMPORARY LOAD CONNECTIONS.

TRICON CONSULTING ENGINEERS
777 S. Harbor Island Blvd, STE 350, TAMPA, FL 33602
813 .227 .9190 FAX 813 . 227 . 9195
Certificate of Authorization No. 00008363

08–10–18

TIMOTHY THOMAS, PE
FLORIDA LICENSE PE 47079

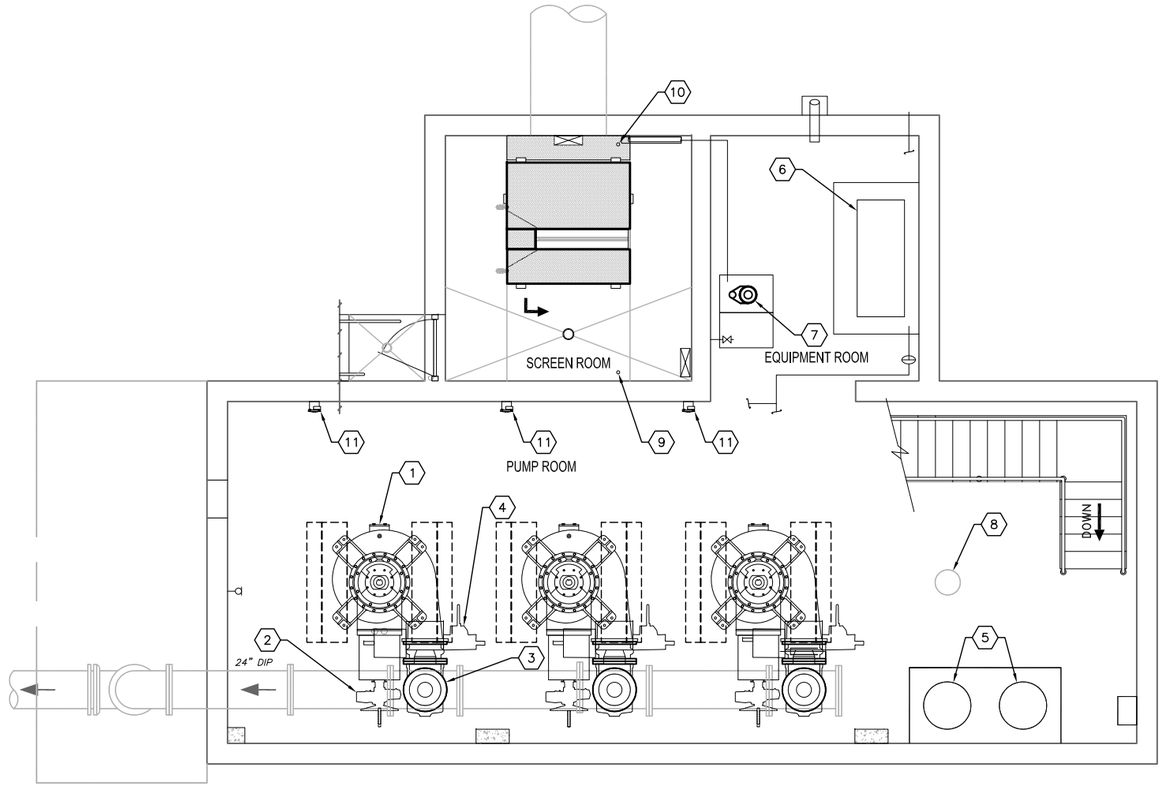
No.	DATE	REVISIONS
3		
2		
1	8–10–18	ADDENDUM #1 – SPELLING CORRECTION

DES: T.D.T.
DRN: J.L.H.
CKD: T.D.T.
DATE: 8/10/18

CITY of TAMPA
WASTEWATER DEPARTMENT

ELECTRICAL SCOPE OF WORK

SHEET
E-3



KEYED NOTES:

1. PROPOSED PUMP AND 250 HP MOTOR (TYP. OF 3)
2. PROPOSED 24" MOTOR OPERATED KNIFE GATE (TYP. OF 3)
3. PROPOSED 20" PLUG VALVE (TYP. OF 3)
4. PROPOSED PNEUMATIC ACTUATOR FOR 20" PLUG VALVE (TYP. OF 3)
5. PROPOSED 120 GALLON VERTICAL TANK MOUNTED COMPRESSOR WITH LOCAL CONTROL PANEL.
6. PROPOSED DUPLEX TANK–MOUNTED VACUUM PRIMING SYSTEM.
7. PROPOSED SUMP PUMP TO BE INSTALLED IN EXISTING SUMP PUMP WETWELL.
8. EXISTING PUMP ACCESS (TO BE USED IN THE FUTURE IF REQUIRED). 1
9. PROPOSED 2" PVC FOR DOWN STREAM BUBBLER.
10. PROPOSED 2" PVC FOR UP STREAM STREAM BUBBLER.
11. PROPOSED LOCATION FOR ELECTRICALLY ACTUATED KNIFE GATE REMOTE OPERATOR. REFER ALSO TO SHEET E–12.

NORTH

0 4' 8' 16'

SCALE: 1/8" = 1'–0"

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08–10–18

TIMOTHY THOMAS, PE
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No.	DATE	REVISIONS
3		
2		
1	8–10–18	ADDENDUM #1 – KEYED NOTE CLARIFICATION

DES: T.D.T.
DRN: J.L.H.
CKD: T.D.T.
DATE: 8/10/18

CITY of TAMPA
WASTEWATER DEPARTMENT

PROPOSED LOWER LEVEL ELECTRICAL EQUIPMENT LAYOUT

SHEET
E-11

MECHANICAL GENERAL NOTES:

1 – PLANS INDICATE THE GENERAL LAYOUT AND LOCATION OF THE MECHANICAL SYSTEM COMPONENTS. UNLESS SPECIFIC DIMENSIONS ARE NOTED, THE ACTUAL LOCATION OF THESE COMPONENTS SHALL BE DETERMINED IN THE FIELD IN COORDINATION WITH THE WORK OF OTHER TRADES, THE USE OF MANUFACTURER'S SHOP DRAWINGS AND SIMILAR CERTIFIED DATA. THESE PLANS SHALL NOT BE SCALED.

2 – NO EXCLUSIONS FROM OR LIMITATIONS IN THE LANGUAGE USED IN THE CONTRACT DOCUMENTS SHALL BE INTERPRETED AS MEANING THAT THE EQUIPMENT, APPURTENANCES, AND/OR ACCESSORIES NECESSARY FOR A COMPLETE AND OPERATIONAL SYSTEM ARE NOT TO BE PROVIDED AS REQUIRED.

3 – THE SEPARATE DIVISIONS SHOWN ON THE CONTRACT DOCUMENTS ARE COMPLEMENTARY OF EACH OTHER AND DO NOT RELIEVE THE CONTRACTOR AND THIS INSTALLER FROM THE RESPONSIBILITY TO PROVIDE THE WORK WHICH IS INDICATED ON ANY OF THE CONTRACT DOCUMENTS. THIS INSTALLER SHALL REVIEW AND COORDINATE THE SCOPE OF HIS WORK WITH THOSE DOCUMENTS TO ASSURE THAT COMPLETE AND FUNCTIONAL SYSTEMS ARE PROVIDED.

4 – THE DIMENSIONS AND CONDITIONS SHOWN ON THE CONTRACT DOCUMENTS ARE BASED ON AVAILABLE EXISTING INFORMATION. THE CONTRACTOR SHALL VISIT THE SITE TO VERIFY EXISTING CONDITIONS AND DIMENSIONS. NOTIFY THE ENGINEER OF ANY DEVIATIONS FROM THE CONTRACT DOCUMENTS.

5 – NO INSTALLATION WORK SHALL PROCEED UNTIL A COMPLETE COORDINATION HAS BEEN DONE WITH ALL TRADES INVOLVED IN THIS PROJECT.

6 – CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY DAMAGE TO THE EXISTING INSTALLATION BEFORE PROCEEDING WITH HIS WORK. DAMAGE CAUSED BY THE CONTRACTOR SHALL BE REPAIRED AT NO COST TO THE CONTRACT AND TO THE OWNER'S SATISFACTION.

1 7 – CONSTRUCTION WORK SHALL COMPLY WITH FLORIDA BUILDING CODE 2017 (6TH EDITION) AND CHAPTER 5 OF THE CITY OF TAMPA CODE.

8 – SUBMIT SHOP DRAWINGS OF ALL EQUIPMENT AND MATERIALS FOR REVIEW. INSTALL AND TEST ALL EQUIPMENT AND MATERIALS IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS AND RECOMMENDATIONS.

9 – DRAWINGS INDICATE THE APPROXIMATE LOCATION OF THE EXISTING AIR MOVING EQUIPMENT BASED ON INFORMATION SHOWN ON AS–BUILT RECORD DOCUMENTS. CONTRACTOR SHALL VERIFY THIS INFORMATION BEFORE PROCEEDING WITH WORK. ALL DEVIATIONS PLUS NEW WORK SHALL BE NOTED ON A NEW SET OF AS–BUILT RECORD DRAWINGS TO BE KEPT AT THE JOB SITE. THESE AS–BUILTS RECORD DRAWINGS TO BE INCLUDED WITH THE PROJECT CLOSE OUT DOCUMENTS.

10 – COORDINATE ROOF PENETRATIONS AND OTHER ROOFING WORK WITH ROOFING CONTRACTOR HOLDING BOND TO ROOF. CONTACT CITY OF TAMPA PROJECT MANAGER FOR THAT INFORMATION.

MECHANICAL SCOPE OF WORK:

1 – UPGRADE VENTILATION SYSTEM TO CURRENT CODE REQUIREMENTS.

2 – SYSTEM TO FACILITATE REMOVAL OF HEAT GENERATED BY NEW PUMPS AND ASSOCIATED CONTROL EQUIPMENT.

3 – PROVIDE FANS, DUCTS, CONTROLS AND AIR INTAKE AND EXHAUST LOUVERS AS SHOWN ON CONTRACT DOCUMENTS.

4 – COORDINATE WORK WITH TRICON AND CITY OF TAMPA PROJECT MANAGERS.

MECHANICAL (VENTILATION) DRAWING LIST

GLOBAL SANCHEZ, INC.
BUILDING SYSTEMS ENGINEERING
3825 Henderson Blvd., Suite 103
Tampa, FL 33629
Phone: 813-281-0001

WOODROFFE CORPORATION ARCHITECTS
1315 E. SEVENTH AVENUE, SUITE 106
TAMPA, FL 33605
813-281-0411
FLORIDA LICENSE NUMBER AA C001379

08–09–18

MAKSIM A. SEGAL, PE
FLORIDA LICENSE PE 71454

No.	DATE	REVISIONS
3		
2		
1	08–09–18	REVISION #1

DES: MH / MS
DRN: MH / GB
CKD: M. SEGAL
DATE: 05/25/18

CITY of TAMPA
WASTEWATER DEPARTMENT

LOUISIANA PUMPING STATION REHABILITATION
MECHANICAL GENERAL

SHEET
V0.1

SECTION 25 31 01

FIELD INSTRUMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Scope:

1. Provide all labor, materials, equipment and incidentals as shown, specified and required to furnish, install, calibrate, test, adjust and place into satisfactory operation all primary sensors and field instruments furnished under this Section.

2. Install all in-line flow elements and provide taps in the process piping systems for installation of other flow, pressure, level and temperature sensing instrumentation.

3. Drawings and Specifications illustrate and specify functional and general construction requirements of the sensors and field instruments and do not necessarily show or specify all components, wiring, piping and accessories required to make a completely integrated system. Provide all components, piping, wiring, accessories and labor required for a complete, workable and integrated system.

B. Instruments furnished under other Sections

1. Certain field instruments are specified to be included with the equipment furnished by the vendor under other specification sections. These instruments shall generally meet the requirements specified in this section where applicable.

2. Instruments furnished by other equipment vendors/manufacturers are not included in the schedule at the end of this section but are generally shown on the P&IDs.

C. Coordination: Coordinate the installation of all items specified herein and required to ensure the complete and proper interfacing of all the components and systems.

D. Related Sections:

1. Section 25 31 00 - General Instrumentation and Control
2. Section 25 31 02 - Panel Devices And Enclosure Construction
3. Section 25 31 03 - PLC Systems

1.02 QUALITY ASSURANCE

A. Comply with the requirements of Section 25 31 00, General Instrumentation and Control.

B. Acceptable Manufacturers:

1. Furnish primary sensors and field instruments by the named manufacturers or equal equipment by other manufacturers.

2. The named manufacturers have been specified to establish the standard of quality and performance of the equipment to be supplied.

3. Obtain all sensors and field instruments of a given type from the same manufacturer.

4. The primary sensors and field devices shall be interchangeable with similar function existing primary sensors and field devices to minimize spare parts inventory.

C. Manufacturer's Responsibilities and Services:

1. Design and manufacture the primary sensors and field instruments in accordance with the applicable general design requirements specified in Section 25 31 00, General Requirements, and the detailed specifications herein.

2. Field supervision, inspection, start-up and training in accordance with the requirements of the Specific Provisions.

1.03 SUBMITTALS

A. Comply with the requirements specified in the Specific Provisions and Section 25 31 00, General Instrumentation and Control.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements specified in Section 25 31 00, General Instrumentation and Control.

B. Primary sensors and field instruments shall not be delivered to the site until all product information and system Shop Drawings for the sensors and instruments have been approved.

1.05 IDENTIFICATION TAGS

A. All sensors and field instruments shall have an identification tag meeting the following requirements:

1. Tag numbers for sensors and field instruments shall be as listed on the Drawings as the equipment number.

2. The identifying tag number shall be permanently etched or embossed onto a stainless steel tag which shall be fastened to the device housing with stainless steel rivets or self tapping screws of appropriate size.

3. Where neither of the above fastenings can be accomplished, tags shall be permanently attached to the device by a circlet of 1/16-inch diameter stainless steel wire rope.

4. All sensors and field instruments mounted on or within panels shall have the stainless steel identification tag installed so that the numbers are easily visible to service personnel.

1.06 SPARE PARTS:

A. Provide the following spare parts:

1. One complete bubbler level transmitter system package including one (1) Yokogawa EJA series gauge pressure transmitter, spare air filter, air flow regulator and purgemeter.

2. One (1) ABB water master transmitter.

PART 2 PRODUCTS

2.01 GENERAL:

A. Provide components to operate on 115 volt ac, single phase, 60 hertz electrical service unless otherwise specified.

B. Provide two-wire transmitter power supplies as required. Loop power supplies are to be installed in the PLC cabinets complete with a separate fuse and blown fuse indicator for each analog circuit.

C. Provide fuses or switches for equipment as recommended by the instrument manufacturer.

D. Provide contacts for control of motor operated or electrically operated equipment rated minimum 10 amp at 115 volts ac, 60 hertz. Provide

contacts for low level analog signal switching of the gold bifurcated, cross bar type.

E. Provide 4-20 mA dc analog output signals from all process transmitters.

F. Where interposing relays are required to provide proper contact rating from devices interfacing to the PLCs, install the relays in the PLC cabinets. See Section 25 31 02.

G. Furnish all necessary accessories for installation, including mounting brackets, floor stands, hardware and like items.

H. Provide tool kits and test equipment, as recommended by the manufacturer, necessary for assembling, calibrating and maintaining equipment.

2.02 BUBBLER LEVEL TRANSMITTER

A. Provide air bubbler-type level transmitter components assembled in a separate bubbler control panel, complete with air pressure regulators, constant differential relays, pneumatic tubing, valves and pressure transmitter as shown.

B. Air Filter: Provide coalescing air filter for moisture and particulate removal. Provide ½" NPT air connections, Grade 6 filter element, auto drain and DPI indicator. Provide Parker model HN2S-6QUW or equal.

C. Pressure Regulator: Provide air supply filter-regulator with 0-120 psi output range adjustment, 3-micron filter with self-relieving design. Provide Siemens Model 91-HF or equal.

D. Constant Differential Relays: Provide a constant differential relay for each bubbler to maintain a constant volumetric flow rate of bubbler air to the liquid level bubbler downtube. Provide integral needle valve to adjust the air flow rate. Design the differential relay to ensure a constant volumetric rate of flow, regardless of variations in the process or supply pressure. Provide integral purgemeter (rotameter) to indicate the air flow. Indicator to have a scale suitable for 0-2.5 scfh air flow. Provide Siemens Model 62-VA or equal.

E. Level Gauges:

1. Provide bronze bourdon tube actuated, 4 ½ -inch size, phenolic case with glass or clear plastic window.

2. Scale: 0-15 psi / 0-34 feet combination gauge

3. Accuracy: 0.5 percent of range (Grade 2A per ANSI B40.1)

4. Manufacturer: Ashcroft, Weksler, US Gauge or equal.

F. Stainless Steel Tubing: Fully annealed, type 304 seamless meeting ASTM A269 with stainless steel compression type fittings.

G. Tubing Valves: instrument grade, ball type shutoff. Stainless steel construction.

H. Level Transmitter:

1. Differential capacitance cell type. Two-wire, 4-20 mAdc output signal. Loop powered from 24 volts dc nominal. Output load impedance of at least 550 ohms.

2. Microprocessor based "smart" electronics. HART protocol compatible.

3. Accuracy: +\- 0.10 percent of calibrated span.

4. Span and zero continuously adjustable, either locally or via hand-held digital interface.

5. NEMA 4 housing. Suitable for operation over ambient temperature range of 20-120 degrees F.

6. Ceramic or stainless steel wetted parts. Stainless steel bleed and drain fittings. All metal external parts.

7. Integral 4-digit LCD output indicator graduated 0-100 percent. Provide integral mounting bracket suitable for wall or pipestand mounting.

8. ½-inch NPT process connections.

9. Manufacturer: Yokogawa EJA430 or equal

2.03 INFRARED HYDROCARBON GAS ANALYZER

A. The hydrocarbon gas detector shall be a diffusion-based point-type infrared gas detector type approved to provide continuous monitoring of methanol gas concentrations in the range of 0 to 100% LEL.

B. The detector shall provide a 4-20 mA output signal, corresponding to the detected gas concentration.

C. The detector shall operate at 24VDC with an operating range of 18-30VDC.

D. The detector shall be suitable for use in outdoor applications.

E. The detector shall be globally certified for use in Class 1, Divisions 1 and 2, and Zones 1 and 2 hazardous areas.

F. The detector shall comply to ANSI/ISA 12.13.01-2000 performance standards.

G. The detector shall not require routine calibration to ensure proper operation.

H. The detector shall provide fail-safe operation.

I. The detector shall automatically provide a continuous self-test to indicate a fault or fouled optics condition.

J. The detector shall provide a multi-layered filtering system to protect optics from dirt and water ingress.

K. The detector shall provide an internal heating system to minimize condensation, allowing reliable operation through temperature extremes.

L. The detector shall produce a 4-20mA output to indicate a calibration or fault condition.

M. The detector shall provide a 0 to 100% LEL detection range.

N. Acceptable manufactures.

1. Det-Tronics Model PIR9400S3P2AW with stainless steel detector.

PART 3 EXECUTION

3.01 ERECTION, INSTALLATION AND APPLICATION

A. General

1. Strictly follow manufacturer recommendation for installation of the field instruments. The Contractor shall be responsible for any problems resulting from any deviation from manufacturer installation instructions.

2. Mount all transmitters vertically, with the integral indicators facing front or sides. For pipe mounted instruments, provide sufficient clearance to permit 360° access to the units.

3. Seal all conduit and wiring entries into all instruments installed below ground or in vaults with non-setting transparent potting material. Seals shall be water tight, suitable for submergence in 30 feet of water.

3.02 FIELD QUALITY CONTROL

A. Manufacturers Field Service

1. Secure the services of factory personnel for instrument start-up and calibration. Calibrate each instrument, including its complete instrument loop. Indication at remote receiving instruments, including any SCADA system operator interface screens, shall be equal to readings at local transmitter indicators.

2. Provide written loop-calibration report for each instrument loop, which shall include, but not limited to the following:

a. Date and time the final calibration was completed.

b. Weather conditions at the time the final calibration was performed.

c. Comparison of readings at the local transmitters with readings at the remote receiving instruments.

d. Verification of operation of all contact outputs, including those at the receiving instruments.

e. Description of method of calibration.

f. Provide a table showing calculated and measured values at 0%, 25%, 50%, 75%, and 100%.

g. Names and signatures of factory personnel performing calibration.

h. Names and signatures of Owner representative witnessing calibration process.

END OF SECTION

SECTION 25 31 03

PROGRAMMABLE LOGIC CONTROL (PLC) SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. This section includes requirements for providing a Programmable Logic Control (PLC) system, local operator interface systems and all appurtenances required for monitoring and control of equipment and unit processes. The PLC will serve as the digital SCADA system interface to field devices and signals. The SCADA shall be remotely connected to a SCADA HMI workstation located remotely at the H. F. Curren Wastewater Treatment Plant.

B. Programming and Software Configuration

1. All programming and software configuration for the Motorola ACE 3600 RTU shall be included as part of this contract work.

2. All programming and software configuration for the PLC and HMI will be included as part of this contract.

C. Provide all submittal documents within 90 days of Notice to Proceed.

D. Work includes all elements of the systems specified. Provide all control hardware complete with power supplies, enclosures, accessories, and other appurtenances. Provide installation of new equipment, and testing necessary for the proper operation of the control system.

E. Related Sections

1. Section 25 31 00 - General Instrumentation and Control
2. Section 25 31 01 - Field Instruments
3. Section 25 31 02 - Panel Devices and Enclosure Construction

1.02 SYSTEM DESCRIPTION

A. Existing System

1. The existing Pump Control in the Pump Station is to be removed and turned over to the City of Tampa for inventory purposes.

2. There is an existing Motorola MOSCAD™ radio telemetry system connected to the existing SCADA PLC via serial data link. This telemetry system provides a backup communication link to the treatment plant SCADA system. This system will be replaced by a Motorola ACE3600 unit. Refer to specification section 25 31 04. The existing Motorola MOSCAD™ unit may be utilized to provide temporary communications during construction. Refer to contract drawings.

B. Design Requirements

1. Program the PLC to achieve pump station control and monitoring described in Section 25 31 00.

2. Fully configure PLC system and appurtenances to form a complete working system.

C. Provide complete systems, which shall include, but not be limited to I/O racks or chassis, power supplies, input and output modules, special communication modules, local operator interface systems, and power and communication cables.

D. Provide one copy of PLC programming software and one copy of operator interface system programming software as specified herein. Software licensing to be for the City of Tampa. Turn all software and manuals over to Owner personnel at job completion.

1.03 SUBMITTALS

A. Submit product data as required in Section 25 31 00.

1. Submit data sheets and catalog literature on each type of equipment.

2. Submit programming and installation manuals for each type of equipment.

B. Documentation:

1. Provide all documentation related to PLC configuration.

2. Furnish all manuals, PLC logic documentation and application programmer's notes.

3. Furnish listing of PLC register tables.

4. Furnish hard copy printout of all PLC logic at project closeout.

C. Operation and Maintenance Manuals: Submit operation and maintenance manuals.

1.04 SPARE PARTS

A. Provide the following spare parts:

1. One (1) ACE3600 FLN3572A Mixed I/O Card

2. One (1) ACE3600 FCN6650A Radio Card

3. Two (2) GE IC693MDL241, 24VDC Input Modules

4. Two (2) GE IC693ALG223, Analog Input Modules

5. One (1) GE IC693MDL730, 24VDC Output Module

6. One (1) GE IC693ALG392, Analog Output Module

7. One (1) GE IC693CHS392, 12-Slot Expansion Rack

8. One (1) GE IC695CPE305, RX3i CPU

9. One (1) GE IC695CMM004, Serial Communications Module

10. One (1) Maple Systems HMI5150P Operator Interface

11. One (1) Maple Systems HMI5070B Operator Interface

12. Four (4) Phoenix Contact 2838186 Surge Protection Devices

13. Twelve (12) fuses of each size furnished

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. General

1. The PLC system shall comprise the following categories of components: Baseplates, Power Supplies, CPUs, I/O Modules, Option Modules, and Cables.

B. Manufacturer

To ensure compatibility with other Wastewater Department control systems, and to limit the City's inventory of spare parts, the Programmable Logic Controller components shall be a GE RX3I series. Do not substitute.

C. Baseplates

1. Provide a new 12 slot Universal baseplate and a new 12 slot expansion baseplate as required by the contract documents.

D. Power Supplies

1. Provide the power supplies indicated on the contract drawings. Provide power supply suitable for 120-VAC single phase input power.

E. Input and Output (I/O) Modules

1. Provide the required I/O modules to enable the PLC to interface with input and output field devices such as switches, sensors, relays, and solenoids. Provide both discrete and analog I/O types as required by the application. Provide 16 channel discrete and analog input modules. Provide a minimum of 25% spare I/O, or 2 spare I/O, (whichever is greater) for each type used. Provide I/O modules as specified on the contract drawings.

F. Option Modules

1. Provide Option Modules as required for this application. These modules shall extend the capability of the PLC beyond the basic functions providing such things as communications and networking options, motion control, high speed counting, temperature control, interfacing to operator interface stations, etc. Provide modules which plug into the baseplate as part of the

integrated PLC system; stand-alone converters, etc, are not acceptable.

G. Cables

1. Provide PLC manufacturer's standard prefabricated cables to connect the PLC components together or to other systems. For example, cables shall be provided to:

   a. interconnect baseplates

   b. connect a programmer to the CPU or to an option module

   c. connect option modules to field devices or other systems.

2. Provide cables of the proper length. No splices shall be allowed.

H. Software and Documentation

1. Program the PLC in ladder logic using IBM compatible software. Provide all configuration software and all necessary interface hardware and cables under this Contract to become the property of the City. The software is to be designed, developed, and documented by the Contractor. The Contractor shall be responsible for providing the details of the design and supplying the City with a set of reproducible as-built drawings. The Operation and Maintenance Manual shall include program documentation containing ample comments and a narrative of the actual working program with a symbol cross-reference legend for the system.

I. Operator Interface Terminals

1. Provide 15-inch diagonal color graphic Operator Interface Terminal (OIT).

2. Display: 1024x768 TFT color.

3. Touchscreen: analog resistive

4. Communications:

a. Ethernet port

b. 3 serial ports, RS-232/RS-485

c. 2 USB ports

5. Multiple simultaneous protocols for multi-controller communications.

6. 256MB flash memory, 256MB SDRAM.

7. NEMA 4 enclosure suitable for 32-122 degrees F.

8. Power: 24VDC. Integrator to provide suitable DC power supply for the OIT or power from the PLC panel 24VDC loop power supply.

9. Provide complete with Windows based configuration software and cables for the OIT.

10. Manufacturer: Maple Systems model HMI5150P or equal.

11. Provide 7-inch diagonal color graphic Operator Interface Terminal (OIT).

12. Display: 800x480 TFT color.

13. Communications:

a. Ethernet port

14. Multiple simultaneous protocols for multi-controller communications.

15. NEMA 4 enclosure suitable for 32-122 degrees F.

16. Power: 24VDC. Integrator to provide suitable DC power supply for the OIT or power from the PLC panel 24VDC loop power supply.

17. Manufacturer: Maple Systems model HMI5070B or equal.

2.02 ENCLOSURES

A. Provide the PLC in the enclosures as specified on the contract drawings.

Power supply

A. Provide a small UPS at PLC panel as specified on the contract drawings.

PART 3 EXECUTION

3.01 INSTALLATION AND APPLICATION

A. Inputs and Outputs Isolation

1. Design PLC discrete inputs to monitor dry contact closures, sourced from the PLC enclosure.

2. Design PLC discrete outputs to energize terminal block style interposing relays as specified in Section 25 31 02.

B. Provide all communication cables necessary for complete working systems. Provide surge protection on all communication ports as necessary.

C. Interface with Other Products

1. Provide all special interface modules necessary for complete working systems. These shall include all necessary cables and connectors as required.

D. Testing

1. Test all control function as described in Section 25 31 00.

3.02 INPUT/OUTPUT SIGNAL SUMMARY SCHEDULE

A. Input and output signals for the Pump Control PLC are shown on the drawings. The I/O is summarized by location in the table below.

B. The I/O summary represents the SCADA PLC hard-wired inputs and outputs for the Pump Control PLC specified in this Section.

C. In addition to the 12 spare discrete inputs shown on the drawings, provide minimum 25 percent installed spare I/O of each type, or 2 I/O, whichever is greater. Round up to the nearest whole signal number.

1. Spare I/O shall be installed, wired and interfaced to the terminal strips.

2. Expandability. Allow any or all prewired spare points to become active points. Include related documentation changes. Spares utilization will be subject to following limitations.

a. Change will not be made subsequent to Submittal approval of PLC panel or process area loop drawings.

b. Treat changing of active points to spare points in same manner as incorporation of spares.

D. Signal types are as follows:

1. DI Digital (discrete) Input

2. DO Digital (discrete) Output

3. AI Analog Input

4. AO Analog Output

TABLE 25 31 03-1
Input/Output Point List for CP-L01

POINT EPN	TYPE	DESCRIPTION	TRM BLK	TB PT	CRD #	CRD PT	MIN VL	MAX VL
LOUSAI101	Analog In	Pump No. 1 Motor Vibr	(1)	(1)	AI1	1	(1)	(1)
LOUSAI102	Analog In	Pump No. 1 Motor Temp	(1)	(1)	AI1	2	(1)	(1)
LOUSAI103	Analog In	Pump No. 1 Pump Vibr	(1)	(1)	AI1	3	(1)	(1)
LOUSAI104	Analog In	Pump No. 1 Pump Temp	(1)	(1)	AI1	4	(1)	(1)
LOUSAI105	Analog In	Pump No. 2 Motor Vibr	(1)	(1)	AI1	5	(1)	(1)
LOUSAI106	Analog In	Pump No. 2 Motor Temp	(1)	(1)	AI1	6	(1)	(1)
LOUSAI107	Analog In	Pump No. 2 Pump Vibr	(1)	(1)	AI1	7	(1)	(1)
LOUSAI108	Analog In	Pump No. 2 Pump Temp	(1)	(1)	AI1	8	(1)	(1)
LOUSAI109	Analog In	Pump No. 3 Motor Vibr	(1)	(1)	AI1	9	(1)	(1)
LOUSAI110	Analog In	Pump No. 3 Motor Temp	(1)	(1)	AI1	10	(1)	(1)
LOUSAI111	Analog In	Pump No. 3 Pump Vibr	(1)	(1)	AI1	11	(1)	(1)
LOUSAI112	Analog In	Pump No. 3 Pump Temp	(1)	(1)	AI1	12	(1)	(1)
LOUSAI113	Analog In	Spare	(1)	(1)	AI1	13	(1)	(1)
LOUSAI114	Analog In	Spare	(1)	(1)	AI1	14	(1)	(1)
LOUSAI115	Analog In	Spare	(1)	(1)	AI1	15	(1)	(1)
LOUSAI116	Analog In	Spare	(1)	(1)	AI1	16	(1)	(1)
LOUSAI201	Analog In	Flow Meter	(1)	(1)	AI2	1	(1)	(1)
LOUSAI202	Analog In	Down Stream Level	(1)	(1)	AI2	2	(1)	(1)
LOUSAI203	Analog In	Up Stream Level	(1)	(1)	AI2	3	(1)	(1)
LOUSAI204	Analog In	Generator Fuel Tank Level	(1)	(1)	AI2	4	(1)	(1)
LOUSAI205	Analog In	LEL Level	(1)	(1)	AI2	5	(1)	(1)

POINT EPN	TYPE	DESCRIPTION	TRM BLK	TB PT	CRD #	CRD PT	MIN VL	MAX VL
LOUSAI206	Analog In	Spare	(1)	(1)	AI2	6	(1)	(1)
LOUSAI207	Analog In	Spare	(1)	(1)	AI2	7	(1)	(1)
LOUSAI208	Analog In	Spare	(1)	(1)	AI2	8	(1)	(1)
LOUSAI209	Analog In	Spare	(1)	(1)	AI2	9	(1)	(1)
LOUSAI210	Analog In	Spare	(1)	(1)	AI2	10	(1)	(1)
LOUSAI211	Analog In	Spare	(1)	(1)	AI2	11	(1)	(1)
LOUSAI212	Analog In	Spare	(1)	(1)	AI2	12	(1)	(1)
LOUSAI213	Analog In	Spare	(1)	(1)	AI2	13	(1)	(1)
LOUSAI214	Analog In	Spare	(1)	(1)	AI2	14	(1)	(1)
LOUSAI215	Analog In	Spare	(1)	(1)	AI2	15	(1)	(1)
LOUSAI216	Analog In	Spare	(1)	(1)	AI2	16	(1)	(1)
LOUSAO301	Analog Out	AFD No. 1 Speed Command	(1)	(1)	AO3	1	(1)	(1)
LOUSAO302	Analog Out	AFD No. 2 Speed Command	(1)	(1)	AO3	2	(1)	(1)
LOUSAO303	Analog Out	AFD No. 3 Speed Command	(1)	(1)	AO3	3	(1)	(1)
LOUSAO304	Analog Out	CP-L01 LEL Indication	(1)	(1)	AO3	4	(1)	(1)
LOUSAO305	Analog Out	Spare	(1)	(1)	AO3	5	(1)	(1)
LOUSAO306	Analog Out	Spare	(1)	(1)	AO3	6	(1)	(1)
LOUSAO307	Analog Out	Spare	(1)	(1)	AO3	7	(1)	(1)
LOUSAO308	Analog Out	Spare	(1)	(1)	AO3	8	(1)	(1)
LOUSAO309	Analog Out	Spare	(1)	(1)	AO3	1	(1)	(1)
LOUSDO401	Digital Out	AFD No. 1 Run Command	(1)	(1)	DO4	1	0	1
LOUSDO402	Digital Out	AFD No. 2 Run Command	(1)	(1)	DO4	2	0	1

POINT EPN	TYPE	DESCRIPTION	TRM BLK	TB PT	CRD #	CRD PT	MIN VL	MAX VL
LOUSDO403	Digital Out	AFD No. 3 Run Command	(1)	(1)	DO4	3	0	1
LOUSDO404	Digital Out	LEL Alarm Light	(1)	(1)	DO4	4	0	1
LOUSDO401	Digital Out	Spare	(1)	(1)	DO4	5	0	1
LOUSDO401	Digital Out	Spare	(1)	(1)	DO4	6	0	1
LOUSDO401	Digital Out	Spare	(1)	(1)	DO4	7	0	1
LOUSDO401	Digital Out	Spare	(1)	(1)	DO4	8	0	1
LOUSDI501	Digital In	Pump 1 Auto Selected	(1)	(1)	DI5	1	0	1
LOUSDI502	Digital In	Pump 1 OFF Selected	(1)	(1)	DI5	2	0	1
LOUSDI503	Digital In	AFD 1 E-STOP	(1)	(1)	DI5	3	0	1
LOUSDI504	Digital In	AFD 1 Run Status	(1)	(1)	DI5	4	0	1
LOUSDI505	Digital In	AFD 1 Fault	(1)	(1)	DI5	5	0	1
LOUSDI506	Digital In	AFD 1 Control Power OK	(1)	(1)	DI5	6	0	1
LOUSDI507	Digital In	Pump 1 Not Ready	(1)	(1)	DI5	7	0	1
LOUSDI508	Digital In	Pump 1 Discharge Valve Fail	(1)	(1)	DI5	8	0	1
LOUSDI509	Digital In	Pump 1 Vibration Warning Alarm	(1)	(1)	DI5	9	0	1
LOUSDI510	Digital In	Motor 1 Vibration Warning Alarm	(1)	(1)	DI5	10	0	1
LOUSDI511	Digital In	Pump 1 CTC Temp Alarm	(1)	(1)	DI5	11	0	1
LOUSDI512	Digital In	Spare	(1)	(1)	DI5	12	0	1
LOUSDI513	Digital In	Spare	(1)	(1)	DI5	13	0	1
LOUSDI514	Digital In	Spare	(1)	(1)	DI5	14	0	1
LOUSDI515	Digital In	Spare	(1)	(1)	DI5	15	0	1
LOUSDI516	Digital In	Spare	(1)	(1)	DI5	16	0	1

POINT EPN	TYPE	DESCRIPTION	TRM BLK	TB PT	CRD #	CRD PT	MIN VL	MAX VL
LOUSDI601	Digital In	Pump 2 Auto Selected	(1)	(1)	DI6	1	0	1
LOUSDI602	Digital In	Pump 2 OFF Selected	(1)	(1)	DI6	2	0	1
LOUSDI603	Digital In	AFD 2 E-STOP	(1)	(1)	DI6	3	0	1
LOUSDI604	Digital In	AFD 2 Run Status	(1)	(1)	DI6	4	0	1
LOUSDI605	Digital In	AFD 2 Fault	(1)	(1)	DI6	5	0	1
LOUSDI606	Digital In	AFD 2 Control Power OK	(1)	(1)	DI6	6	0	1
LOUSDI607	Digital In	Pump 2 Not Ready	(1)	(1)	DI6	7	0	1
LOUSDI608	Digital In	Pump 2 Discharge Valve Fail	(1)	(1)	DI6	8	0	1
LOUSDI609	Digital In	Pump 2 Vibration Warning Alarm	(1)	(1)	DI6	9	0	1
LOUSDI610	Digital In	Motor 2 Vibration Warning Alarm	(1)	(1)	DI6	10	0	1
LOUSDI611	Digital In	Pump 2 CTC Temp Alarm	(1)	(1)	DI6	11	0	1
LOUSDI612	Digital In	Spare	(1)	(1)	DI6	12	0	1
LOUSDI613	Digital In	Spare	(1)	(1)	DI6	13	0	1
LOUSDI614	Digital In	Spare	(1)	(1)	DI6	14	0	1
LOUSDI615	Digital In	Spare	(1)	(1)	DI6	15	0	1
LOUSDI616	Digital In	Spare	(1)	(1)	DI6	16	0	1
LOUSDI701	Digital In	Pump 3 Auto Selected	(1)	(1)	DI7	1	0	1
LOUSDI702	Digital In	Pump 3 OFF Selected	(1)	(1)	DI7	2	0	1
LOUSDI703	Digital In	AFD 3 E-STOP	(1)	(1)	DI7	3	0	1
LOUSDI704	Digital In	AFD 3 Run Status	(1)	(1)	DI7	4	0	1

LOUSDI705	Digital In	AFD 3 Fault	(1)	(1)	DI7	5	0	1
LOUSDI706	Digital In	AFD 3 Control Power OK	(1)	(1)	DI7	6	0	1
LOUSDI707	Digital In	Pump 3 Not Ready	(1)	(1)	DI7	7	0	1
LOUSDI708	Digital In	Pump 3 Discharge Valve Fail	(1)	(1)	DI7	8	0	1
LOUSDI709	Digital In	Pump 3 Vibration Warning Alarm	(1)	(1)	DI7	9	0	1
LOUSDI710	Digital In	Motor 3 Vibration Warning Alarm	(1)	(1)	DI7	10	0	1
LOUSDI711	Digital In	Pump 3 CTC Temp Alarm	(1)	(1)	DI7	11	0	1
LOUSDI712	Digital In	Spare	(1)	(1)	DI7	12	0	1
LOUSDI713	Digital In	Spare	(1)	(1)	DI7	13	0	1
LOUSDI714	Digital In	Spare	(1)	(1)	DI7	14	0	1
LOUSDI715	Digital In	Spare	(1)	(1)	DI7	15	0	1
LOUSDI716	Digital In	Spare	(1)	(1)	DI7	16	0	1
LOUSDI801	Digital In	Future Pump 4	(1)	(1)	DI8	1	0	1
LOUSDI802	Digital In	Future Pump 4	(1)	(1)	DI8	2	0	1
LOUSDI803	Digital In	Future Pump 4	(1)	(1)	DI8	3	0	1
LOUSDI804	Digital In	Future Pump 4	(1)	(1)	DI8	4	0	1
LOUSDI805	Digital In	Future Pump 4	(1)	(1)	DI8	5	0	1
LOUSDI806	Digital In	Future Pump 4	(1)	(1)	DI8	6	0	1
LOUSDI807	Digital In	Future Pump 4	(1)	(1)	DI8	7	0	1
LOUSDI808	Digital In	Future Pump 4	(1)	(1)	DI8	8	0	1

LOUSDI809	Digital In	Future Pump 4	(1)	(1)	DI8	9	0	1
LOUSDI810	Digital In	Future Pump 4	(1)	(1)	DI8	10	0	1
LOUSDI811	Digital In	Future Pump 4	(1)	(1)	DI8	11	0	1
LOUSDI812	Digital In	EF-1 No Air Flow	(1)	(1)	DI8	12	0	1
LOUSDI813	Digital In	EF-2 No Air Flow	(1)	(1)	DI8	13	0	1
LOUSDI814	Digital In	EF-1 Running	(1)	(1)	DI8	14	0	1
LOUSDI815	Digital In	EF-2 Running	(1)	(1)	DI8	15	0	1
LOUSDI816	Digital In	Spare	(1)	(1)	DI8	16	0	1
LOUSDI901	Digital In	SF-1 50% Speed	(1)	(1)	DI9	1	0	1
LOUSDI902	Digital In	SF-1 100% Speed	(1)	(1)	DI9	2	0	1
LOUSDI903	Digital In	SF-1 No Air Flow	(1)	(1)	DI9	3	0	1
LOUSDI904	Digital In	SF-1 AFD Fault	(1)	(1)	DI9	4	0	1
LOUSDI905	Digital In	SF-1 AFD Running	(1)	(1)	DI9	5	0	1
LOUSDI906	Digital In	SF-2 100% Speed	(1)	(1)	DI9	6	0	1
LOUSDI907	Digital In	SF-2 No Air Flow	(1)	(1)	DI9	7	0	1
LOUSDI908	Digital In	SF-2 AFD Fault	(1)	(1)	DI9	8	0	1
LOUSDI909	Digital In	SF-2 AFD Running	(1)	(1)	DI9	9	0	1
LOUSDI910	Digital In	Bar Screen Rake Running	(1)	(1)	DI9	10	0	1
LOUSDI911	Digital In	Bar Screen Compactor Running	(1)	(1)	DI9	11	0	1
LOUSDI912	Digital In	Bar Screen Common Alarm	(1)	(1)	DI9	12	0	1

LOUSDI913	Digital In	German Club MH Alarm	(1)	(1)	DI9	13	0	1
LOUSDI914	Digital In	German Club Common Alarm	(1)	(1)	DI9	14	0	1
LOUSDI915	Digital In	River Shore MH Alarm Pump 4	(1)	(1)	DI9	15	0	1
LOUSDI916	Digital In	River Shore Common Alarm	(1)	(1)	DI9	16	0	1
LOUSDI1001	Digital In	AC-1 Low Pressure	(1)	(1)	DI10	1	0	1
LOUSDI1002	Digital In	AC-1 Fault	(1)	(1)	DI9	2	0	1
LOUSDI1003	Digital In	AC-2 Low Pressure	(1)	(1)	DI9	3	0	1
LOUSDI1004	Digital In	AC-2 Fault	(1)	(1)	DI9	4	0	1
LOUSDI1005	Digital In	VP-1 Fault	(1)	(1)	DI10	5	0	1
LOUSDI1006	Digital In	VP-2 Fault	(1)	(1)	DI10	6	0	1
LOUSDI1007	Digital In	Generator Running	(1)	(1)	DI10	7	0	1
LOUSDI1008	Digital In	Generator Fault	(1)	(1)	DI10	8	0	1
LOUSDI1009	Digital In	Generator Diesel Tank Low Alarm	(1)	(1)	DI10	9	0	1
LOUSDI1010	Digital In	Generator Diesel Tank High Alarm	(1)	(1)	DI10	10	0	1
LOUSDI1011	Digital In	Generator Diesel Tank Leak Alarm	(1)	(1)	DI10	11	0	1
LOUSDI1012	Digital In	52-B1a Closed	(1)	(1)	DI10	12	0	1
LOUSDI1013	Digital In	86-B1 Tripped	(1)	(1)	DI10	13	0	1
LOUSDI1014	Digital In	52-B2a Closed	(1)	(1)	DI10	14	0	1
LOUSDI1015	Digital In	86-B2 Tripped	(1)	(1)	DI10	15	0	1
LOUSDI1016	Digital In	Spare	(1)	(1)	DI10	16	0	1

LOUSDI1101	Digital In	Pump 1 Vibration	(1)	(1)	DI11	1	0	1
LOUSDI1102	Digital In	Motor 1 Vibration	(1)	(1)	DI11	2	0	1
LOUSDI1103	Digital In	Pump 2 Vibration	(1)	(1)	DI11	3	0	1
LOUSDI1104	Digital In	Motor 2 Vibration	(1)	(1)	DI11	4	0	1
LOUSDI1105	Digital In	Pump 3 Vibration	(1)	(1)	DI11	5	0	1
LOUSDI1106	Digital In	Motor 3 Vibration	(1)	(1)	DI11	6	0	1
LOUSDI1107	Digital In	Spare	(1)	(1)	DI11	7	0	1
LOUSDI1108	Digital In	Spare	(1)	(1)	DI11	8	0	1
LOUSDI1109	Digital In	AFD 1 Running	(1)	(1)	DI11	9	0	1
LOUSDI1110	Digital In	AFD 1 Fault	(1)	(1)	DI11	10	0	1
LOUSDI1111	Digital In	AFD 2 Running	(1)	(1)	DI11	11	0	1
LOUSDI1112	Digital In	AFD 2 Fault	(1)	(1)	DI11	12	0	1
LOUSDI1113	Digital In	AFD 3 Running	(1)	(1)	DI11	13	0	1
LOUSDI1114	Digital In	AFD 3 Fault	(1)	(1)	DI11	14	0	1
LOUSDI1115	Digital In	52-B3a Closed	(1)	(1)	DI11	15	0	1
LOUSDI1116	Digital In	86-B3 Tripped	(1)	(1)	DI11	16	0	1
LOUSDI1201	Digital In	52-1a Closed	(1)	(1)	DI12	1	0	1
LOUSDI1202	Digital In	86-1 Tripped	(1)	(1)	DI12	2	0	1
LOUSDI1203	Digital In	52-2a Closed	(1)	(1)	DI12	3	0	1
LOUSDI1204	Digital In	86-2 Tripped	(1)	(1)	DI12	4	0	1

LOUSDI1205	Digital In	52-G1a Closed	(1)	(1)	DI12	5	0	1
LOUSDI1206	Digital In	86-G1 Tripped	(1)	(1)	DI12	6	0	1
LOUSDI1207	Digital In	52-G2a Closed	(1)	(1)	DI12	7	0	1
LOUSDI1208	Digital In	86-G2 Tripped	(1)	(1)	DI12	8	0	1
LOUSDI1209	Digital In	52-Ta Closed	(1)	(1)	DI12	9	0	1
LOUSDI1210	Digital In	86-T Tripped	(1)	(1)	DI12	10	0	1
LOUSDI1211	Digital In	52-A1a Closed	(1)	(1)	DI12	11	0	1
LOUSDI1212	Digital In	86-A1 Tripped	(1)	(1)	DI12	12	0	1
LOUSDI1213	Digital In	52-A2a Closed	(1)	(1)	DI12	13	0	1
LOUSDI1214	Digital In	86-A2 Tripped	(1)	(1)	DI12	14	0	1
LOUSDI1215	Digital In	52-A3a Closed	(1)	(1)	DI12	15	0	1
LOUSDI1216	Digital In	86-A3 Tripped	(1)	(1)	DI12	16	0	1

(1) To be provided as part of the contract document record drawings.

END OF SECTION

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LAWGIBB GROUP

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DEC - 7 2001

December 6, 2001

Mr. Mike Dyer
City of Tampa
Department of Sanitary Sewers
306 East Jackson Street, 6E
Tampa, Florida 33602

813-274-8006
813-274-8448 - fax

Subject: **Drilling Services**
Louisiana Pumping Station Replacement
Tampa, Florida
LAW Project No. 40120-1-0140

Dear Mr. Dyer:

Law Engineering and Environmental Services, Inc. (LAW), is pleased to submit the results of the soil test borings drilled for the proposed project. You authorized this program on November 13, 2001. Our services were conducted in general accordance with The Agreement for City-Wide Materials Testing FY 2001-2002, dated April 26, 2001.

Our services consisted of drilling five soil test borings to the following depths: 40, 25, 25, 40, and 15 feet. After the completion of each SPT boring the borehole was grouted. The results of the borings are attached to this report. Also attached is a key to the classification terminology used.

The boring locations were generally drilled within the locations indicated on the plan accompanying your November 13, 2001 letter. The approximate location is illustrated on Figure 1, which has been included in the Attachments of this report.

We appreciate the opportunity to be of service to the **City of Tampa** on this project. Should you have any questions in regards to this report, or if we can be of any further assistance, please contact this office.

Sincerely,

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Craig M. Anstett, E.I.
Project Engineer

12-6-01
Curtis J. Roos, P.E.
Chief Engineer
Florida Registration No. 27570

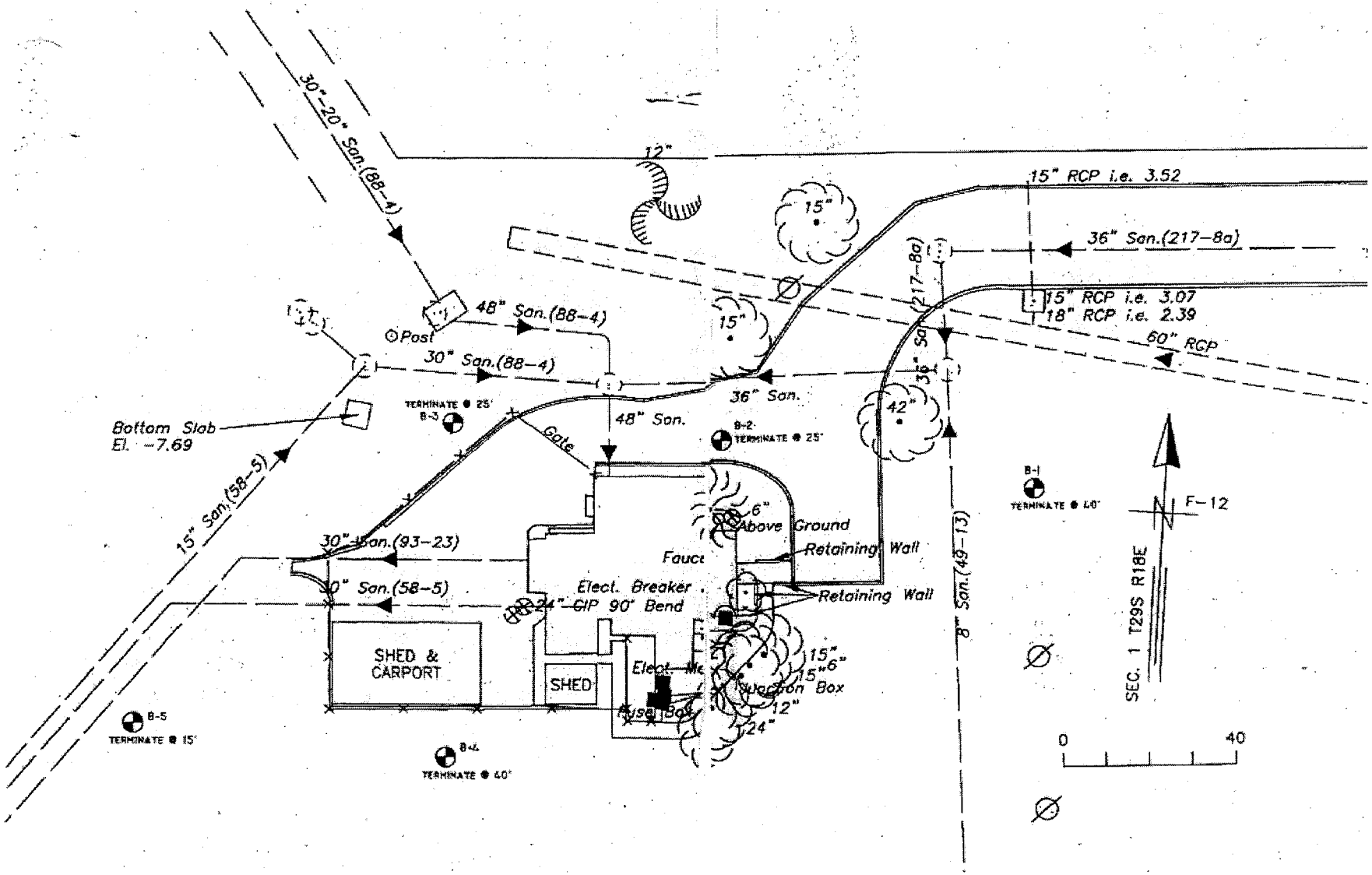
\\TAMPA-9\GROUPS\GEOTECH\2001\Projects\21-0140 City of Tampa - Louisiana Pumpin Station\21-0140 Louisiana Pump Station.doc

Attachments: Field Exploration Plan
Soil Test Boring Records
Key to Symbols and Descriptions

Distribution: 2 - Addressee
1 – File

ATTACHMENTS

FIELD EXPLORATION PLAN



LEGEND

APPROXIMATE SOIL TEST BORING LOCATIONS.

Prepared/Date: CMA 12/04/01
Checked/Date: CJR 12/04/01

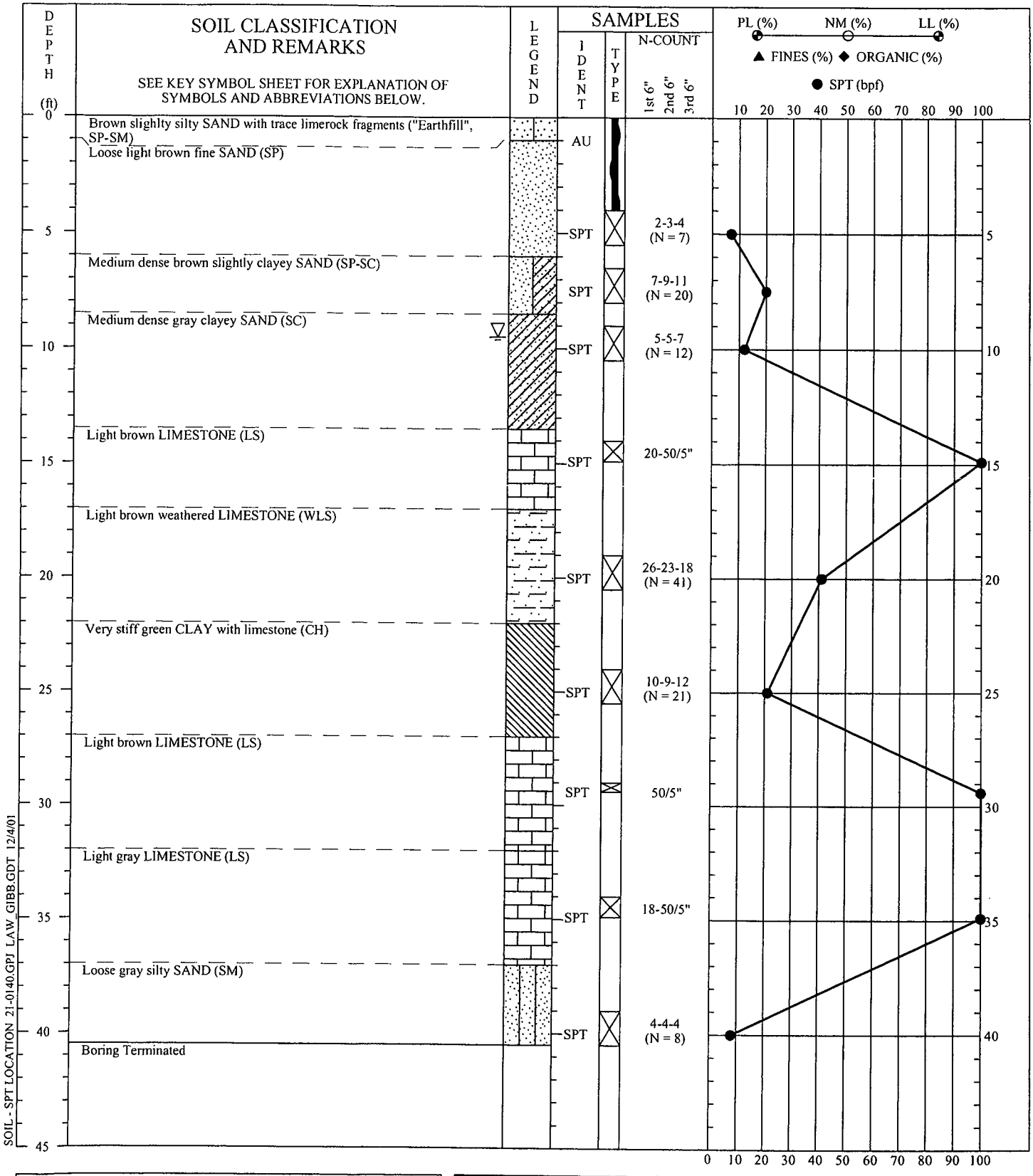
CITY OF TAMPA
LOUISIANA PUMPING STATION REPLACEMENT
TAMPA, FLORIDA

LAW
LAWGIBB Group Member

FIELD EXPLORATION PLAN

Project 40120-1-0140 Figure 1

SOIL TEST BORING RECORDS



DRILLER: DK
EQUIPMENT: CME Power Drill Rig
METHOD: Rotary Wash with Bentonite "Mud", ASTM D-1586
HOLE DIA.: 2 15/16 inches
REMARKS:

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE

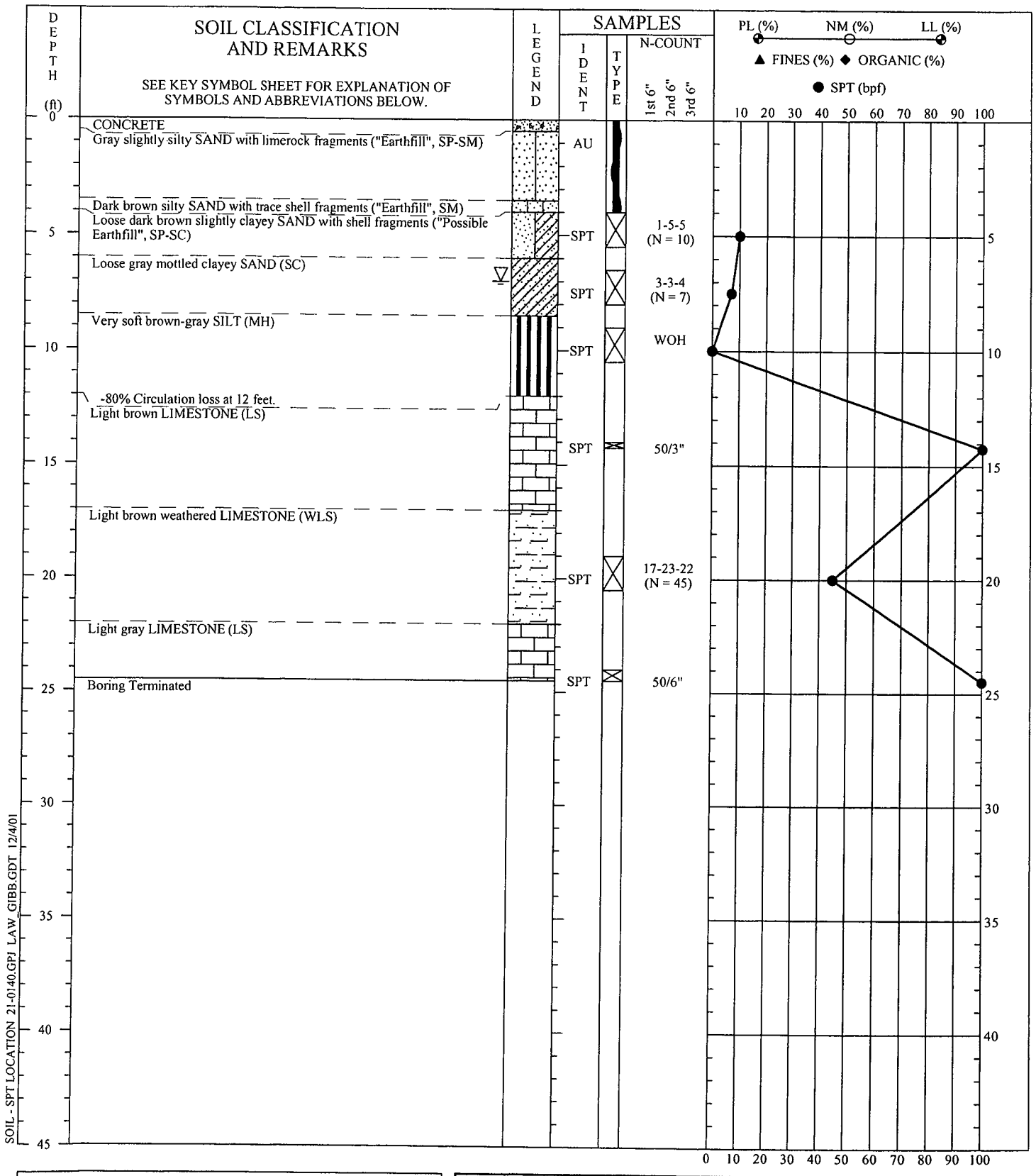
SOIL TEST BORING RECORD

PROJECT: LOUISIANA PUMPING STATION
LOCATION: TAMPA, FLORIDA

BORING NO.: B-1
PAGE 1 OF 1

DRILLED: November 21, 2001
PROJ. NO.: 40120-1-0140
CHECKED BY: GJ

LAW



DRILLER: DK
EQUIPMENT: CME Power Drill Rig
METHOD: Rotary Wash with Bentonite "Mud", ASTM D-1586
HOLE DIA.: 2 15/16 inches
REMARKS:

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE.

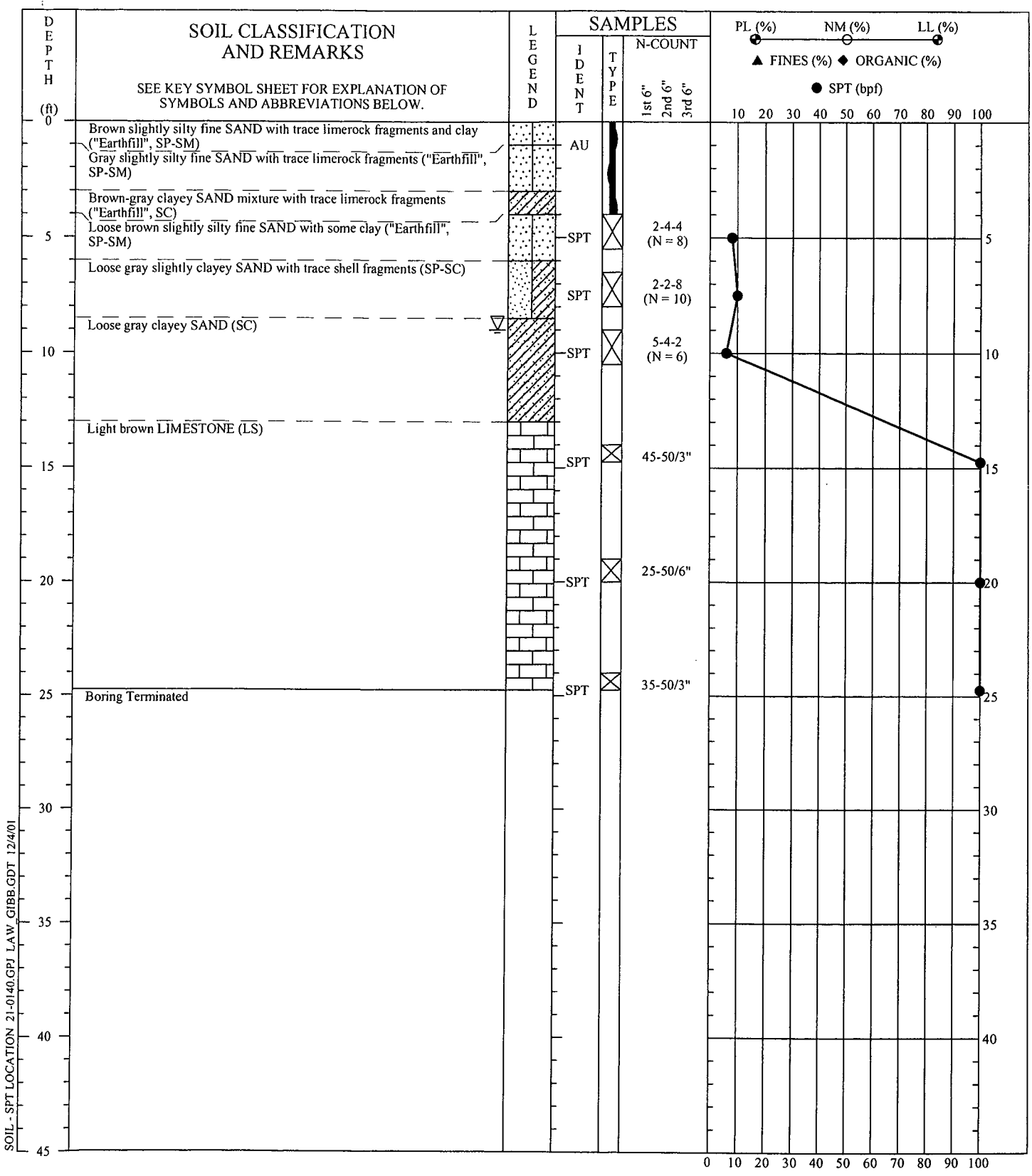
SOIL TEST BORING RECORD

PROJECT: LOUISIANA PUMPING STATION
LOCATION: TAMPA, FLORIDA

BORING NO.: B-2
PAGE 1 OF 1

DRILLED: November 20, 2001
PROJ. NO.: 40120-1-0140
CHECKED BY:

LAW



SOIL - SPT LOCATION 21-0140.GPJ LAW_GIBB.GDT 12/4/01

DRILLER: DK
EQUIPMENT: CME Power Drill Rig
METHOD: Rotary Wash with Bentonite "Mud", ASTM D-1586
HOLE DIA.: 2 15/16 inches
REMARKS:

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE.

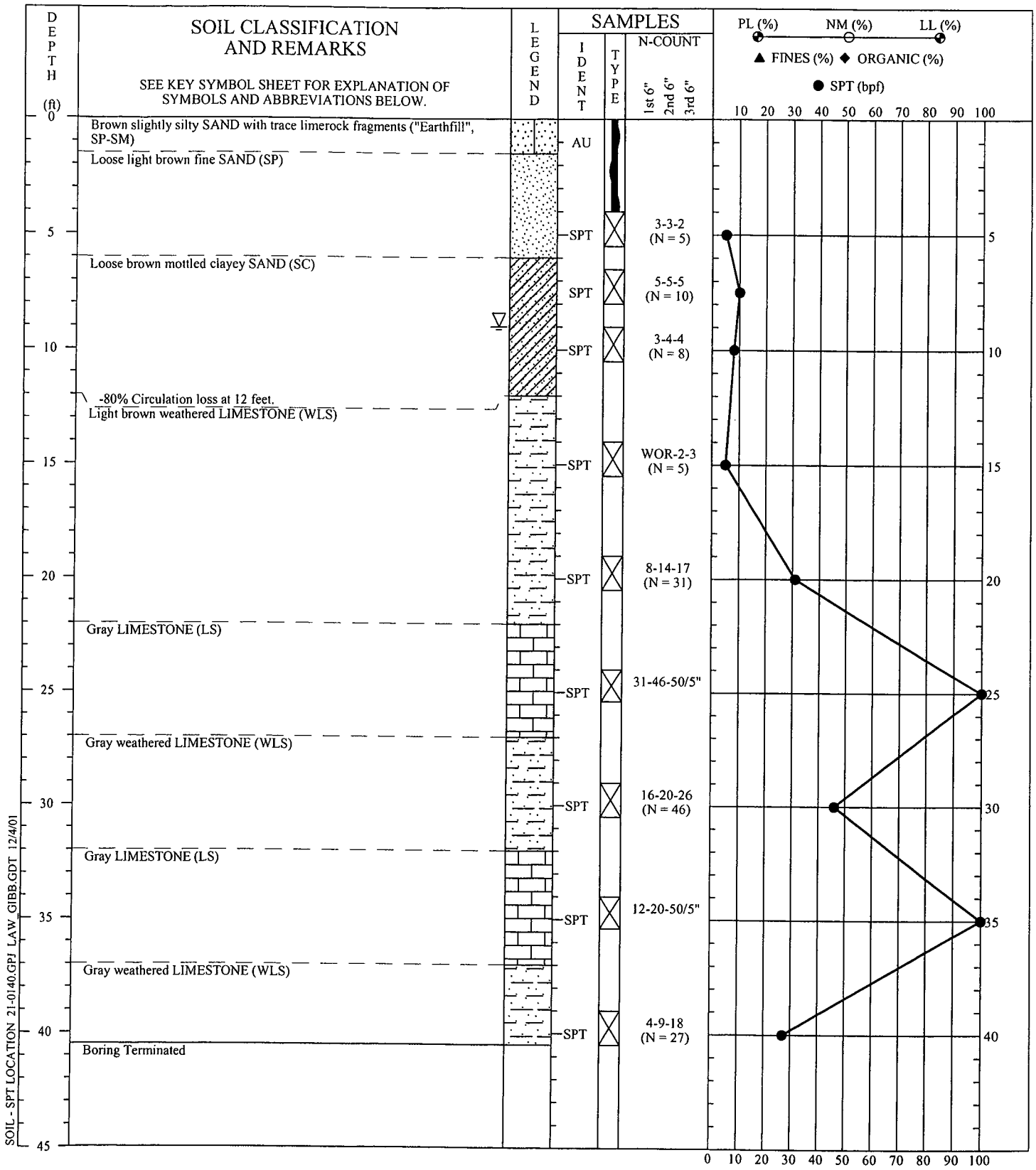
SOIL TEST BORING RECORD

PROJECT: LOUISIANA PUMPING STATION
LOCATION: TAMPA, FLORIDA

BORING NO.: B-3
PAGE 1 OF 1

DRILLED: November 20, 2001
PROJ. NO.: 40120-1-0140
CHECKED BY: CL

LAW



DRILLER:	DK
EQUIPMENT:	CME Power Drill Rig
METHOD:	Rotary Wash with Bentonite "Mud", ASTM D-1586
HOLE DIA.:	2 15/16 inches
REMARKS:	

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE.

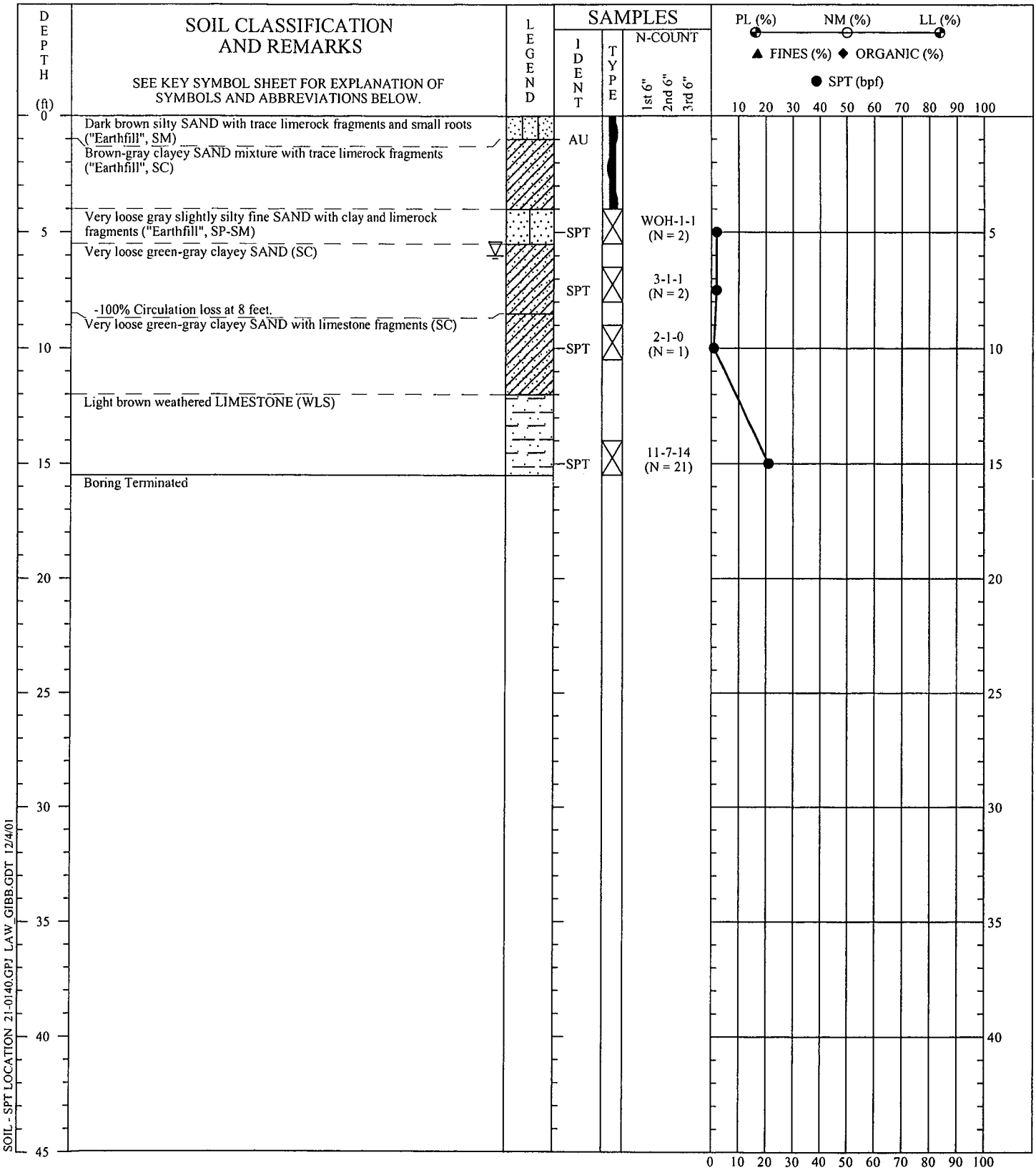
SOIL TEST BORING RECORD

PROJECT: LOUISIANA PUMPING STATION
LOCATION: TAMPA, FLORIDA

BORING NO.: B-4
PAGE 1 OF 1

DRILLED: November 21, 2001
PROJ. NO.: 40120-1-0140
CHECKED BY: CJ

LAW



DRILLER: DK
EQUIPMENT: CME Power Drill Rig
METHOD: Rotary Wash with Bentonite "Mud", ASTM D-1586
HOLE DIA.: 2 15/16 inches
REMARKS:

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE.

SOIL TEST BORING RECORD

PROJECT: LOUISIANA PUMPING STATION
LOCATION: TAMPA, FLORIDA

BORING NO.: B-5
PAGE 1 OF 1

DRILLED: November 20, 2001
PROJ. NO.: 40120-1-0140
CHECKED BY: CDr

LAW

KEY TO CLASSIFICATIONS & SYMBOLS

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS More than 50% of material is LARGER than No. 200 sieve size)	GRAVELS (More than 50% of coarse fraction is LARGER than the No. 4 sieve size)	CLEAN GRAVELS (Little or no fines)	GW	Well graded gravels, gravel - sand mixtures, little or no fines.
			GP	Poorly graded gravels or grave - sand mixtures, little or no fines.
		GRAVELS WITH FINES (Appreciable amount of fines)	GM	Silty gravels, gravel - sand - silt mixtures.
			GC	Clayey gravels, gravel - sand - clay mixtures.
	SANDS (More than 50% of coarse fraction is SMALLER than the No. 4 Sieve Size)	CLEAN SANDS (Little or no fines)	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES (Appreciable amount of fines)	SM	Silty sands, sand - silt mixtures
			SC	Clayey sands, sand - clay mixtures.
FINE GRAINED SOILS More than 50% of material is SMALLER than No. 200 sieve size)	SILTS AND CLAYS (Liquid limit LESS than 50)		ML	Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts and with slight plasticity.
			CL	Inorganic lays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS (Liquid limit GREATER than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			PT	Peat and other highly organic soils.
LIMESTONE FORMATIONS			LS	Limestone
			WLS	Weathered Limestone

	Undisturbed Sample		Auger Cuttings
	Split Spoon Sample		No Recovery
	Rock Core		Dilatometer
	Water Table at time of drilling		Water Table after 24 hours

CORRELATION OF PENETRATION RESISTANCE WITH RELATIVE DENSITY AND CONSISTENCY

SAND & GRAVEL		SILT & CLAY	
No. of Blows	Relative Density	No. of Blows	Consistency
0 - 4	Very Loose	0 - 2	Very Soft
5 - 10	Loose	3 - 4	Soft
11 - 30	Medium Dense	5 - 8	Firm
31 - 50	Dense	9 - 15	Stiff
Over 50	Very Dense	16 - 30	Very Stiff
		Over 30	Hard

LIMESTONE	
No. of Blows	Consistency
10 - 20	Soft
21 - 50	Medium
51 - 50/3"	Hard
Greater than 50/3"	Very Hard

OUNDARY CLASSIFICATIONS: Soils possessing characteristics of two groups are designated by combinations of group symbols.

SILT OR CLAY	SAND			GRAVEL		Cobbles	Boulders
	Fine	Medium	Coarse	Fine	Coarse		

No.200 No.40 No.10 No.4 3/4" 3" 12"

U.S. STANDARD SIEVE SIZE

eference: The Unified Soil Classification System, Corps of Engineers, U.S. Army Technical lemorandum No. 3-357, Vol. 1, March, 1953 (Revised April, 1960)

KEY TO SYMBOLS AND DESCRIPTIONS

LAW

LAWGIBB Group Member

SP-55 Electrical Requirements

Electrical Work

Where definite requirements are not set forth in the Specifications, all electrical equipment, materials, and work under this Division shall comply with the requirements of the Occupational Safety and Health Act (OSHA) and shall be in accordance with applicable ANSI, IEEE, IPCEA, and NEMA standards. The work shall be performed in compliance with the latest issue of the NEC adopted by the Florida Building Code, all applicable state and municipal regulations and codes, and the service rules of the Tampa Electric Company, unless otherwise specified or directed. All equipment and materials shall be listed and labeled as complying with the requirements of a Southern Building Code Congress International (SBCCI) recognized testing laboratory for the particular applications wherever available.

Where listing is not available for the device as a whole, refer to the provision entitled "Electrical Equipment Certification" for submittal requirements.

Electrician Qualifications

The Electrician performing the electrical work shall be licensed / certified in the State of Florida. The Electrician shall be thoroughly experienced with, and regularly engaged in, the demolition, installation, and trouble-shooting of industrial power systems with nominal system voltages of 240 through 13,200 volts. The Electrician shall provide the City with example of projects demonstrating at least three (3) years of successful industrial power system installations that involve water or wastewater facilities. The Electrician shall supply the City with references of industrial clients that will attest to the Electrician's work experience.

In addition, the electrical contractor or sub-contractor shall provide a minimum 3 project examples and references for industrial projects of similar complexity, content and scope of this project. These examples shall demonstrate that the contractor has specific experience with the following:

1) Installation of Variable Frequency Drives (VFD) and Motor Control Centers (MCC) for wastewater and water facilities that involve the use of multiple pumps with 250 horsepower (HP) motors or larger
2) Installation of 750 kW standby generator or larger
3) Installation of electrical, instrumentation and control systems for a 25 MGD wastewater pumping station or larger.

SPECIFICATIONS

WORKMANSHIP AND MATERIALS

SECTION 1 - EXCAVATION - EARTH AND ROCK

W-1.01 General

Opencut excavations shall be made to the widths and depths necessary for constructing all structures, pipelines and other conduits included in the Contract, according to the Plans, and includes the excavation of any material which, in the opinion of the Engineer, is desirable to be excavated for any purpose pertinent to the construction of the work. Banks more than 5 feet high, where a danger of slides or cave-ins exist, shall be shored or sloped to the angle of repose.

Where excavations are to be made below groundwater, the Contractor shall submit to the Engineer for approval, in detail, his proposed method for control of groundwater, including a description of the equipment he plans to use and the arrangement of such equipment. No such excavation shall be started until approval of the Engineer has been obtained. Dewatering work shall be included in the Contract Items for pipelines, box culverts, inlets, manholes and other structures, and pumping stations, and no separate payment will be made therefor.

W-1.02 Clearing

The site of all opencut excavations shall first be cleared of obstructions preparatory to excavation. This includes the removal and disposal of vegetation, trees, stumps, roots and bushes, except as specified under the subsection headed "Trench Excavation."

W-1.03 Authorized Additional Excavation

In case the materials encountered at the elevations shown are not suitable, or in case it is found desirable or necessary to go to an additional depth, or to an additional depth and width, the excavation shall be carried to such additional depth and width as the Engineer may direct in writing. The Contractor shall refill such excavated space with either Class D concrete, or select sand or crushed stone fill material, as ordered. Where necessary, fill materials shall be compacted to avoid future settlement. Additional earth excavations so ordered and concrete, or selected sand or crushed stone fill material ordered for filling such additional excavation and compaction of select sand or crushed stone fill material will be paid for under the appropriate Contract Items or where no such items exist, as extra work as specified in Article 7 of the Agreement.

W-1.04 Unauthorized Excavation

Wherever the excavation is carried beyond or below the lines and grades shown or given by the Engineer, except as specified in the subsection headed "Authorized Additional Excavation," all such excavated space shall be refilled with such material and in such manner as may be directed in order to ensure the stability of the various structures. Spaces beneath all manholes, structures or pipelines excavated without authority shall be refilled by the Contractor at his own expense, with

Class D concrete, or select sand or crushed stone fill material, and properly compacted, as ordered by the Engineer, and no separate payment will be made therefor.

W-1.05 Segregation and Disposal of Material

Topsoil suitable for final grading and landscaping and excavated material suitable for backfilling or embankments shall be stockpiled separately on the site in locations approved by the Engineer. Excavated and other material shall not be stored nearer than 4 feet from the edge of any excavation and shall be so stored and retained as to prevent its falling or sliding back into the excavation. Surplus excavated material and excavated material unsuitable for backfilling or embankments shall become the property of the Contractor and shall be transported, as approved by the Engineer, away from the site of the work to the Contractor's own place of disposal.

W-1.06 Shoring and Sheeting

All excavations shall be properly shored, sheeted, and braced or cut back at the proper slope to furnish safe working conditions, to prevent shifting of material, to prevent damage to structures or other work, and to avoid delay to the work, all in compliance with the U. S. Department of Labor Safety and Health Regulations for Construction promulgated under the Occupational Safety and Health Act of 1970 (PL 91-596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL 91-54). The minimum shoring, sheeting and bracing for trench excavations shall meet the general trenching requirements of the safety and health regulations. Before starting excavation for jacking pits and structures, the Contractor shall submit complete design calculations and working drawings of proposed sheeting and bracing arrangements which have been prepared, signed and sealed by a Professional Engineer registered in the State of Florida. Bracing shall be so arranged as not to place any strain on portions of completed work until the general construction has proceeded far enough, in the opinion of the Engineer, to provide ample strength. If the Engineer is of the opinion that at any point the sheeting or supports furnished are inadequate or unsuited for the purpose, he may order additional sheeting or supports to be installed. Whether or not such orders are issued, the sole responsibility for the design, methods of installation, and adequacy of the sheeting and supports shall be and shall remain that of the Contractor.

Tight sheeting shall be used in that portion of the excavation in City collector and arterial streets and in State and County highways below the intersection of a 1 on 1 slope line from the edge of the existing pavement to the nearest face of the excavation.

In general, sheeting for pipelines shall not be driven below the elevation of the top of the pipe. If it is necessary to drive the sheeting below that elevation in order to obtain a dry trench or satisfactory working conditions, the sheeting shall be cut off at the top of the pipe and left in place below the top of the pipe at no additional cost.

The sheeting and bracing shall be removed as the excavation is refilled in such a manner as to avoid the caving in of the bank or disturbance to adjacent areas or structures except as otherwise shown or directed. Voids left by the withdrawal of the sheeting shall be carefully filled by ramming or otherwise as directed.

Permission of the Engineer shall be obtained before the removal of any shoring, sheeting, or bracing. Such permission by the Engineer shall not relieve the Contractor from the responsibility for injury or to other property or persons from failure to leave such sheeting and bracing in place.

W-1.07 Sheeting Left in Place

The Engineer may order, in writing, any or all sheeting or bracing to be left in place for the purpose of preventing injury to the structures or to other property or to persons, whether such sheeting or bracing was shown on the Plans or placed at his direction or otherwise. If left in place, such sheeting shall be cut off at the elevation ordered, but, in general, such cutoffs shall be at least 18 inches below the final ground surface. Bracing remaining in place shall be driven up tight.

The right of the Engineer to order sheeting and bracing left in place shall not be construed as creating any obligation on his part to issue such orders.

Sheeting and bracing left in place, by written order of the Engineer, will be paid for under the appropriate Contract Item if included in the Proposal or otherwise by provisions of extra work as specified in Section 7 of the Agreement.

W-1.08 Removal of Water

At all times during the excavation period and until completion and acceptance of the work at final inspection, ample means and equipment shall be provided with which to remove promptly and dispose of properly all water entering any excavation or other parts of the work. The excavation shall be kept dry. No water shall be allowed to rise over or come in contact with masonry and concrete until the concrete and mortar have attained a set satisfactory to the Engineer and, in any event, not sooner than 12 hours after placing the masonry or concrete. Water pumped or drained from the work hereunder shall be disposed of in a safe and suitable manner without damage to adjacent property or streets or to other work under construction. Water shall not be discharged onto streets without adequate protection of the surface at the point of discharge. No water shall be discharged into sanitary sewers. No water containing settleable solids shall be discharged into storm sewers. Any and all damage caused by dewatering the work shall be promptly repaired by the Contractor.

W-1.09 Structure Excavation

Excavations shall be of sufficient size and only of sufficient size to permit the work to be economically and properly constructed in the manner and of the size specified. The bottom of the excavation in earth and rock shall have the shape and dimensions of the underside of the structure wherever the nature of the ground will permit.

W-1.10 Trench Excavation

Before starting trench excavation, all obstructions which are to be removed or relocated shall be cleared away. Trees, shrubs, poles, and other structures which are to be preserved shall be properly braced and protected. All trees and large shrubs shall be preserved with damage to the

root structure held to a minimum, unless otherwise shown or specified. Small shrubs may be preserved or replaced with equivalent specimens.

The width of trenches shall be such as to provide adequate space for workmen to place, joint, and backfill the pipe properly, but shall be kept to a minimum. Unless otherwise approved by the Engineer, the clear width of the trench at the level of the top of the pipe shall not exceed the sum of the outside diameter of the pipe barrel plus 24 inches.

In sheeted trenches, the clear width of the trench at the level of the top of the pipe shall be measured to the inside of the sheeting.

Should the Contractor exceed the maximum trench widths specified above, without written approval of the Engineer, he may be required to provide, at his own expense, concrete cradle or encasement for the pipe as directed by the Engineer, and no separate payment will be made therefor.

The Contractor shall excavate trenches to the respective depths, below the bottom of the pipe, for the various classes of pipe bedding shown on the Plans so that pipe bedding material can be placed in the bottom of the trench and shaped to provide a continuous, firm bearing for the pipe barrel and bells.

If unstable material is exposed at the level of the bottom of the trench excavation, it shall be excavated in accordance with the subsection headed "Authorized Additional Excavation." When in the judgement of the Engineer the unstable material extends to an excessive depth, he may advise the Contractor in writing to stabilize the trench bottom with a crushed stone, sand mat or gravel mat to ensure firm support for the pipe by other suitable methods. Payment for such trench stabilization will be made under the appropriate Contract Items or where no such items exist, as extra work as specified in Section 7 of the Agreement.

The open excavated trench preceding the pipe laying operation and the unfilled trench with pipe in place shall be kept to a minimum length causing the least disturbance to traffic and use of adjacent property. Ladders shall be provided and so located as to provide means of exit from the trench without more than 25 feet of lateral travel.

W-1.11 Rock Excavation

The term "rock" as used herein shall include all materials which have compressive strengths in excess of 300 psi in their natural undisturbed state and which, in the opinion of the Engineer, require drilling and blasting, wedging, sledging, barring or breaking with power tools not otherwise required for normal excavating.

Rock shall be excavated, within the boundary lines and grades as shown on the Plans, specified, or given by the Engineer. Rock removed from the excavation shall become the property of the Contractor and shall be removed by him away from the site of the work to his own place of disposal, and no separate payment will be made therefor.

All shattered rock and loose pieces shall be removed.

For trench excavation in which pipelines or other conduits are to be placed, the rock shall be excavated to a minimum depth of 6 inches below the bottom of the pipe and the excavated space refilled with pipe bedding material. Placing, compacting, and shaping pipe bedding material shall be included in the various classified unit price Contract Items for pipelines, and no separate payment will be made therefor.

For manhole excavation, the rock shall be excavated to a minimum depth of 8 inches below the bottom of the manhole base for pipelines 24 inches in diameter and larger, and 6 inches below the bottom manhole base for pipelines less than 24 inches in diameter and the excavated space refilled with crushed stone. Placing, compacting, and shaping crushed stone for manhole bases shall be included in the appropriate Contract Items for manhole bases, and no separate payment will be made therefor.

For cast-in-place structures, the rock shall be excavated only to the bottom of the structure or foundation slab.

Excavated space in rock below structures, pipelines, and manholes which exceeds the depths specified above shall be refilled with Class D concrete, crushed stone, or other material as directed by the Engineer. Refilling of over-excavated rock in rock shall be included as part of the rock excavation, and no separate payment will be made therefor.

Where applicable, the requirements of the subsections on "Trench Excavation" and "Structure Excavation" shall be followed.

Blasting may be performed only when approved by the Engineer and authorized by the Agency having jurisdiction over the subject location and in accordance with all laws, ordinances, and regulations of the Agency.

W-1.12 Excavation for Jacking and Augering

Excavation for jacking or augering shall meet the requirements of the Workmanship and Materials section headed "Jacking and Augering."

* * *

SECTION 2 - BACKFILLING

W-2.01 General

All excavation shall be backfilled to the original surface of the ground or to such other grades as may be shown or directed. For areas to be covered by topsoil, backfill shall be left 4 inches below the finished grade or as shown on the Plans. The time elapsing before backfilling is begun shall be subject to the approval of the Engineer. In all backfilling, all compressible and destructible rubbish and refuse which might cause later settlement and all lumber and braces shall be removed from the excavated space before backfilling is started, except that sheeting and bracing shall be left in place or removed as the work progresses.

Construction equipment used to backfill against and over cast-in-place concrete structures shall not be permitted to travel over these structures until the designated concrete strength has been obtained as verified by concrete test cylinders. In special cases where conditions warrant, as determined by the Engineer, the above restriction may be modified if the concrete has gained sufficient strength, as determined from test cylinders, to satisfy design requirements for the removal of forms and the application of load.

W-2.02 Unsuitable Backfill Material

Before backfilling around structures, all rubbish shall be removed from behind the walls.

When the excavated material contains garbage, cinders, glass, tin cans, wood, or other trash or objectionable organic material, as determined by the Engineer, it shall not be used for backfill but shall be disposed of by the Contractor away from the site of the work to his own place of disposal. The unsuitable materials shall be replaced with backfill material which shall be sand, clay, gravel, sandy loam, or other excavated material free of objectionable organic matter, as approved by the Engineer.

W-2.03 Select Fill Material - General

Select fill material shall be used for pipe bedding, manhole bedding, trench and structure backfill, and other purposes as shown on the Plans, specified, and ordered in writing by the Engineer.

Select fill material shall be sand, conforming to the requirements of the subsections headed "Select Fill Material - Sand" or crushed stone or limestone screenings, conforming to the requirements of the subsection headed "Select Fill Material - Crushed Stone."

W-2.04 Select Fill Material - Sand

Sand used for pipe bedding or as select fill material for trench or structure backfill shall consist of job excavated sand or imported sand which can be readily and thoroughly compacted. Sand

shall be reasonably well graded and shall fall within the following gradation limits:

Passing No. 4 sieve - 95 percent (minimum)
Passing No. 200 sieve - 10 percent (maximum)

Sand containing more than 10 percent of material passing the No. 200 sieve or sand which, in the opinion of the Engineer, would have a tendency to flow under pressure when wet will not be acceptable for use as pipe bedding or select fill material for trench or structure backfill

Sand shall not be used for bedding for manholes or other structures.

W-2.05 Select Fill Material - Crushed Stone

Crushed stone used for pipe bedding, manhole base bedding, or as select fill material for trench or structure backfill shall consist of clean, durable rock, angular in shape, which can be readily and thoroughly compacted. Crushed stone shall be reasonably well graded and shall be no greater than a No. 57 stone.

W-2.06 Pipe and Structure Bedding

All pipelines shall be bedded in well graded, compacted select fill material. Select fill material shall be sand, conforming to the subsection headed "Select Fill Material - Sand" and/or crushed stone, conforming to the subsection headed "Select Fill Material - Crushed Stone," as shown on the Plans, specified or ordered in writing by the Engineer. Pipe bedding shall be constructed in accordance with the details shown on the Plans.

When shown on the Plans or ordered in writing by the Engineer, pipelines (except PVC) shall be laid in Class D concrete cradle or encasement.

Precast concrete manhole bases shall be bedded on No. 57 stone, conforming to the subsection headed "Select Fill Material - Crushed Stone," as shown on the Plans.

Cast-in-place manhole bases and other foundations for structures shall be cast against undisturbed earth in clean and dry excavations.

Existing underground structures, tunnels, conduits and pipes crossing the excavation shall be bedded with compacted select fill material. Bedding material shall be placed under and around each existing underground structure, tunnel, conduit or pipe and shall extend underneath and on each side to a distance equal to the depth of the trench below the structure, tunnel, conduit or pipe.

W-2.07 Bedding Placement for Pipelines

Select fill material, used as pipe bedding, shall be placed by hand, in uniform layers not greater than 6 inches in loose thickness and thoroughly compacted in place. Select fill material pipe bedding shall extend to one foot over the top of the pipe.

Each layer of select fill shall be thoroughly tamped and compacted in place by hand or with suitable mechanical or pneumatic tools to a dry density not less than 95 percent of the maximum dry density as determined by AASHTO Des: T-180. No large stone fragments shall be placed in the pipe bedding nor closer than two feet to any point on any pipe.

W-2.08 Bedding Placement for Precast Concrete Manholes

No. 57 stone used for bedding beneath precast manhole bases shall be placed in uniform layers not greater than 6 inches in loose thickness and thoroughly compacted in place with suitable mechanical or pneumatic tools.

W-2.09 Structure Backfill

Backfill around manholes, risers, and structures shall be suitable job excavated material, selected fill material, or other material approved by the Engineer. Such backfill shall extend from the bottom of the excavation or top of structure bedding to the bottom of pavement base course, subgrade for lawn replacement, the top of the existing ground surface, or to such other grades as may be shown or given by the Engineer.

The backfill shall be placed in uniform layers not greater than 18 inches in loose thickness and thoroughly compacted in place with suitable mechanical or pneumatic tools to a dry density of not less than 98 percent of the maximum dry density as determined by AASHTO Des: T-180.

W-2.10 Trench Backfill

Trenches shall be backfilled from 1 foot over the top of the pipe to the bottom of pavement base course, subgrade for lawn replacement, to the top of the existing ground surface or to such other grades as may be shown or given by the Engineer. Trench backfill shall be select fill material, suitable job excavated material or other material, as approved by the Engineer.

Except under pavements and railroad tracks, trench backfill shall be placed in uniform layers not greater than 18 inches in loose thickness and thoroughly compacted in place using heavy-duty tampers such as pneumatic jackhammers with tamping foot attachment or vibrating rollers if required. Each layer shall be compacted to a dry density of not less than 95 percent of the maximum dry density as determined by AASHTO Des: T-180.

Where railroad tracks or pavements and appurtenances for streets or highways are to be placed over trenches, the trench backfill shall be placed in uniform layers not greater than 12 inches in loose thickness and thoroughly compacted in place with equipment as specified above. Each layer shall be compacted to a dry density of not less than 98 percent of the maximum dry density as determined by AASHTO Des: T-180. On City of Tampa streets, each layer shall be compacted as specified above to the bottom of the subbase which is defined as 10 inches below the bottom of the base course. The subbase shall be compacted to 98 percent of modified proctor.

Trench backfilling work shall be done in a manner to prevent dropping of material directly

on top of any conduit or pipe through any great vertical distance. In no case shall backfilling material from a bucket be allowed to fall directly on a structure or pipe and in all cases, the bucket shall be lowered so that the shock of falling earth will not cause damage.

Lumps shall be broken up and if there are any stones, pieces of crushed rock or lumps which cannot be readily broken up, they shall be distributed throughout the mass so that all interstices are solidly filled with fine material.

W-2.11 Backfill for Short Tunnel

Where pipelines are placed in short tunnels, the annular space between the outside of the pipe wall and the tunnel wall shall be completely filled with select fill material or suitable excavated material. Pipelines in short tunnels shall be suitably supported, to permit placing backfill which shall be suitably tamped in place.

W-2.12 Finish Grading

Finish grading shall be performed to meet the existing contour elevations and grades shown on the Plans or given by the Engineer and shall be made to blend into adjacent natural ground surfaces. All finished surfaces shall be left smooth and free to drain.

Grading outside of pipelines or structure lines shall be performed in such a manner as to prevent accumulation of water within the area. Where necessary or where shown on the Drawings, finish grading shall be extended to ensure that water will be carried to drainage ditches, and the construction area left smooth and free from depressions holding water.

W-2.13 Responsibility for After Settlement

Any depression which may develop in backfilled areas from settlement within one year after the work is fully completed and accepted shall be the responsibility of the Contractor. The Contractor shall, at his own expense, provide as needed additional backfill material, pavement base replacement, permanent pavement sidewalk curb and driveway repair or replacement, and lawn replacement and shall perform the necessary reconditioning and restoration work to bring such depressed areas to proper grade as approved by the Engineer.

W-2.14 Inspection and Testing of Backfilling

All backfill shall be subject to test by the Engineer with the assistance of the Contractor.

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SECTION 8 - METAL CASTINGS

W-8.01 General

Metal castings include all miscellaneous ferrous and nonferrous castings.

Wheel guards, valve boxes, manhole frames and covers, stop log grooves, brackets and supports for piping, gutter inlets, floor, roof and gallery drains, stormwater inlets, beehive grates and frames, cleanout covers, and special malleable iron castings and inserts are included in this classification.

W-8.02 Materials

Metal castings shall meet the requirements of the following standards, except as otherwise specified herein.

Gray Iron	ASTM Des: A 48
Malleable Iron	ASTM Des: A 47
Carbon Steel	ASTM Des: A 27
Alloy Steel	ASTM Des: A 148
Aluminum	ASTM Des: B 26
Aluminum Bronze	ASTM Des: B 148
Silicon Bronze	Navy Spec. 46B28
Manganese Bronze	ASTM Des: B 132 or B 147
Ductile Iron	ASTM Des: A 536

W-8.03 Workmanship

Castings shall be made accurately to approved dimensions and shall be planed or ground where marked or where otherwise necessary to secure perfectly flat and true surfaces. Allowance shall be made in the patterns so that the specified thickness shall not be reduced. Manhole and cleanout frames and covers shall conform to the details shown on the Plans and shall be true and shall seat at all points. No plugging of defective castings will be permitted. All castings shall be erected to accurate grades and alignment, and when placed in concrete, they shall be carefully supported to prevent movement during concreting.

W-8.04 Weights

No castings weighing less than 95 percent of the theoretical weight, based on required dimensions, will be accepted. The Contractor shall provide facilities for weighing castings in the presence of the Engineer, or shall furnish invoices showing true weights, certified by the supplier.

* * *

SECTION 10 - DUCTILE IRON PIPE AND FITTINGS

W-10.01 General

All ductile iron pipe shall meet the requirements of AWWA C151. The type and configuration of pipe bedding for buried pipe shall be as shown on the Plans. Coatings and linings for ductile iron pipe and fittings shall conform to the subsection headed "Coatings and Linings," contained herein. Pipe joints shall be bell and spigot, flanged, or mechanical joint as shown on the Plans.

Ductile iron pipe and ductile iron fittings buried in the ground for force mains or installed in pumping stations shall have a minimum thickness of Class 52 unless specified otherwise as shown on the Plans. Ductile push-on iron pipe and fittings for gravity systems, including house laterals, shall be Class 54 and shall have an interior lining as specified in the subsection "Lining for Ductile Iron Gravity Pipe."

W-10.02 Flanged Pipe

Flanged pipe shall conform to the requirements of AWWA C115. Flanges shall be ductile iron and shall have long hubs. There shall be no leakage through the pipe threads, and the flanges shall be designed to prevent corrosion of the threads from outside.

W-10.03 Fittings

All ductile iron fittings shall meet the requirements of AWWA C110 or AWWA C153 and have a pressure rating of 250 psi, or as specified, whichever is larger.

W-10.04 Flanged Joints

Flanged joints shall meet the requirements of ANSI Specification B16.1. Flanges, flange facing drilling, and protecting shall be as specified for flanged pipe. Bolts and nuts for flanged joints shall be Type 316 stainless steel unless otherwise stated on the Plans or directed by the Engineer.

Except where otherwise directed by the Engineer, gaskets for flanged joints shall be of the full-face type, meeting the requirements of ANSI B16.21. Gaskets shall be Nitrile rubber, also known as Buna-N and NBR, as made by the American Seal & Packing Company, Garlock of EnPro Industries, U.S. Rubber Supply Company, or equal.

W-10.05 Mechanical Joints

Mechanical joints shall meet the applicable requirements of AWWA C111/A21.11.

W-10.06 Push-on Joints

Push-on joints shall be of the bell and spigot type which employs a single, elongated grooved gasket to effect the joint seal. Push-on joints shall meet the applicable requirements of AWWA C111.

W-10.07 Wall Castings, Connecting Pieces, and Special Fittings

Wall castings and connecting pieces, such as bell and bell, bell and spigot, bell and flange, flange and flange, flange and spigot, and flange and flare, shall meet the requirements of ANSI Specification A21.10. Unless otherwise shown or specified, fittings 14 inches and larger shall have a pressure rating of 250 psi.

Where special fittings are required, they shall be of an approved design and shall have the same diameters and thickness' as standard fittings, unless otherwise required, but their laying lengths and other functional dimensions shall be determined by their positions in the pipelines and by the particular piping materials to which they connect.

Where water tightness is essential and at other locations where indicated, wall castings shall be provided with an integrally cast intermediate collar located at the center of the wall.

W-10.08 Sleeve-Type Couplings

Except where standard solid sleeves or split sleeves are shown or specified, sleeve-type couplings for ductile iron pipe shall be Style 38 couplings as made by Dresser Industries, Inc., or Type 411 as made by Smith-Blair, or equal. Gaskets shall be of molded rubber, Dresser Plain Grade 27, Smith-Blair 003, or equal. Middle rings shall be without a pipe stop and shall be at least 1/4 inch thick and 5 inches wide for 8-inch and smaller pipe, 3/8 inch thick and 7 inches wide for 10-inch through 30-inch pipe, and 1/2 inch thick and 10 inches wide for 36-inch and larger pipe with follower rings of appropriate thickness, unless otherwise shown or specified.

Sleeve-type couplings shall be shop coated with Dresser Red "D" Shop-Coat, Smith-Blair Standard Blue Shop Coat, or equal nontoxic material compatible with the finished coatings specified.

W-10.09 Coatings and Linings

Pipe which is to be buried shall have the standard outside coating specified in AWWA C151-8.1.

Unless otherwise shown on the Plans or specified, all ductile iron pipe and fittings shall be coated with 40 mils of Protecto 401 interior ceramic epoxy, or approved equal.

The weight and class designation shall be painted conspicuously in white on the outside of each pipe, fitting, and special casting after the shop coat has hardened.

W-10.10 Thrust Restraints

Unless otherwise shown on the Plans, specified or directed by the Engineer, concrete thrust blocks are not allowed.

Ductile iron pipe and fittings with mechanical joints shall be restrained by a device meeting the requirements of Workmanship and Materials section "Restraining Devices".

Ductile iron pipe and fittings with push-on joints that require restraining shall be Clow F-128 "Super Lock Joint," American Cast Iron Pipe "Lok-Fast Joint," U.S. Pipe and Foundry Company "TR Flex," or equal.

Where the glands are to be buried or not exposed to view, the assembly shall be given 2 heavy coats of asphalt varnish after installation.

W-10.11 Lining for Ductile Iron Gravity Pipe

Unless otherwise shown on the Plans or specified, all ductile iron pipe and fittings shall be coated with 40 mils of Protecto 401 interior ceramic epoxy, or approved equal.

W-10.12 Polyethylene Encasement

Unless otherwise shown on the Plans, specified or directed by the Engineer, polyethylene encasement shall be installed on all ductile iron pipe and fittings in accordance with AWWA/ANSI C105/A21.5.

Although not intended to be a completely air-and-water-tight enclosure, the polyethylene shall prevent contact between the pipe and the surrounding backfill.

Polyethylene encasement shall be installed in accordance with the pipe manufacturer's instructions, or in a manner acceptable to the Engineer. Polyethylene encasement shall extend 1 foot beyond the joint in both directions (a total of 2-foot overlap) and shall be adhered to said joint with 2-inch wide green marking tape. The slack width shall be taken up at the top of the pipe to make a snug, but not tight, fit along the barrel of the pipe, securing the fold at quarter points. Upon installation of the encasement, any cuts or damaged portions of the polyethylene encasement shall be securely mended with tape or with a short length of polyethylene sheet, or a tube cut open, wrapped around the pipe to cover the damaged area, and secured in place.

Backfill material shall be the same as specified for pipe without polyethylene wrapping; however, extra care should be taken that the backfill be free from cinders, refuse, boulders, rocks, stones, or other materials that could damage the encasement. Special care shall be taken to prevent damage to the polyethylene wrapping when placing backfill.

Because prolonged exposure to sunlight will deteriorate polyethylene film, such exposure prior to backfilling the wrapped pipe shall be kept to a minimum.

W-10.13 Ductile Iron Pipe Exterior Coating

All pipe and fittings shall have an exterior asphaltic coating conforming to the following requirements:

Viscosity, KU at 25 degrees C	56-60
Flashpoint, degrees F (TCC)	40 degrees F Min
Dry set to touch, minutes	6
Dry hard, minutes	22

W-10.14 Force Main Identification

Ductile iron pipe sanitary force main shall be continuously spiral wrapped with 2-inch wide green stick-on vinyl tape prior to installation for permanent identification purposes. The tape shall have a minimum thickness of 6 mils with a minimum tensile strength of 22 pounds per inch and a minimum

adhesive factor of 40 ounces per inch. The pipe shall be clean and dry when wrapped.

* * *

SECTION 14 - PIPE CRADLES AND ENCASEMENT

W-14.01 General

The Contractor shall furnish and place pipe cradles or pipe encasement, having dimensions as shown on the Plans, when specified in the Contract Items, when shown on the Plans, or when ordered in writing by the Engineer. Pipe cradles and pipe encasement shall be constructed of Class D concrete.

W-14.02 Concrete Cradle for Pipe

When concrete cradle is to be provided, as shown on the Plans or ordered by the Engineer, the sewer shall be laid to grade and supported on concrete blocks near each end. The tops of the blocks shall be shaped to conform to the dimensions of the pipe being laid and shall be set approximately 3/8 inch low. The pipe shall be placed on the blocks on stiff mortar of sufficient thickness to bring the pipes to exact grade. Timber blocking, or a type approved by the Engineer, may be employed in place of concrete blocks. The concrete cradle shall be placed against undisturbed earth on the bottom and sides of the trench. The Class D concrete shall be placed on one side only until it has risen above the invert on the other side, after which the remainder of the concrete shall be deposited on both sides. Suitable means shall be provided to prevent movement of the pipe during the placement of the concrete.

W-14.03 Concrete Encasement of Pipe

The pipe shall be supported and the Class D concrete encasement shall be placed as specified under concrete pipe cradle. The concrete shall be placed against undisturbed earth on the bottom and sides of the trench and continued over the pipe to provide the required thickness of complete encasement.

* * *

SECTION 15 - LAYING AND JOINTING PIPE FOR FORCE MAINS AND SEWERS

W-15.01 General

The installation, delivery, transportation, unloading, and stringing of pipes, fittings, and accessories for force mains and sewers shall be done in accordance with AWWA C600 for ductile iron pipe and ASTM Des: C 12 for clay and concrete pipe and ASTM D 2321 and pipe manufacturer's recommendations for PVC pipe, as modified or supplemented by the specifications of this section and by the details shown on the Plans.

Proper and suitable tools and appliances for the safe and convenient cutting, handling, and laying of the pipe and fittings shall be used.

Suitable fittings shall be used where shown and at connections where grade or alignment changes require offsets greater than those recommended by the pipe manufacturer.

Pipes and fittings shall be thoroughly cleaned before they are laid and shall be kept clean until they are accepted in the completed work.

All lines shall be closed off with bulkheads when pipe laying is not in progress.

Before being laid, all pipe and specials shall be thoroughly examined for defects, and no piece shall be installed which is known to be defective. If any defective piece should be discovered after having being installed, it shall be removed and replaced with a sound one in a satisfactory manner by the Contractor at his own expense.

Pipe shall be thoroughly cleaned before it is laid and shall be kept clean until it is accepted in the completed work. Special care shall be exercised to avoid leaving bits of wood, dirt, and other foreign particles in the pipe. If any such particles are discovered before the final acceptance of the work, they shall be removed and the pipe cleaned at the Contractor's expense.

Pipe laying for sewers shall begin at the low end of a run and proceed upgrade. Generally, all such pipe shall be laid with bells or grooves pointing uphill. Each pipe shall be carefully placed and checked for line and grade.

Adjustments to bring pipe to line and grade shall be made by scraping away or filling in granular material under the body of the pipe, but in no case by wedging or blocking up the barrel. The faces of the spigot ends and the bells shall be brought into fair contact, and the pipe shall be firmly and completely shoved home. As the work progresses, the interior of the pipelines shall be cleaned of all dirt and superfluous materials of every description. All lines shall be kept absolutely clean during construction. Pipelines shall be laid accurately to line and grade.

Gaskets for pipe joints shall be stored in a cool place and protected from light, sunlight, heat, oil, or grease until installed. Any gaskets showing signs of checking, weathering, or other

deterioration will be rejected.

Pipe shall be of the types, sizes, and classes shown on the Plans or as listed in the Contract Items.

Each piece of pipe shall be inspected and cleaned before it is lowered in the trench and any lumps or projections on the face of the spigot or tongue end or the shoulder shall be cut away. No cracked, broken, or defective pieces shall be used in the work.

Concrete pipe manufactured with a plastic sheet liner shall be laid so that the liner is on the crown of the pipe and placed symmetrically about the vertical centerline of the pipe.

Pipe laying will be permitted only in dry trenches having a stable bottom. Where groundwater is encountered, the Contractor shall make every effort to secure an absolutely dry trench bottom.

If, in the opinion of the Engineer, the Contractor has failed to obtain an absolutely dry trench bottom by improper or insufficient use of all known methods of trench dewatering, the Engineer may then order the Contractor to excavate below grade and place sufficient selected fill material, crushed stone, or Class D concrete over the trench bottom at the Contractor's own expense.

If all efforts fail to obtain this condition and the Engineer determines that the trench bottom is unsuitable for pipe foundation, he will order in writing the kind of stabilization to be constructed.

W-15.02 Transportation and Delivery

Every precaution shall be taken to prevent injury to the pipe during transportation and delivery to the site. Extreme care must be taken in loading and unloading the pipe and fittings. Such work must be done slowly with skids or suitable power equipment, and the pipe shall be under perfect control at all times. Under no condition shall the pipe be dropped, bumped, dragged, pushed, or moved in any way which will cause damage to the pipe or coating. When handling the pipe with a crane, a suitable pipe hook or sling around the pipe shall be used. Under no condition shall the sling be allowed to pass through the pipe unless adequate measures are taken to prevent damage to the pipe ends.

If in the process of transportation, handling, or laying, any pipe or special is damaged, such pipe or pipes shall be replaced or repaired by the Contractor at his own expense.

The Contractor shall furnish and install suitable blocking and stakes so as to prevent the pipe from rolling. The type of blocking and stakes, and the method of installation, shall be approved by the Engineer.

W-15.03 Pipe Laying - Trenches

Pipelines shall be laid in trench excavation on bedding material as specified under the

Workmanship and Materials section headed "Backfilling," Class D concrete cradle or other foundations as shown on the Plans, specified, or ordered in writing by the Engineer. The pipe shall be properly secured against movement and pipe joints shall be made in the excavation as required.

The pipe bedding shall be carefully graded, compacted, and formed to fit the bottom quadrant of the pipe. Bell holes shall be cut out for each joint as required to permit the joint to be properly made and allow the barrel of the pipe to have full bearing throughout its length.

Where pipelines are laid in Class D concrete cradle or encasement, the installation shall conform to the requirements of the Workmanship and Materials section headed "Pipe Cradles and Encasements."

Pipelines laid on other type foundations shall be installed as specified for such other foundations or as directed in writing by the Engineer.

W-15.04 Lateral Detection Tape

Detectable underground marking tape shall be installed over all laterals from the edge of pavement to the property line. The tape shall be Lineguard encased aluminum foil, or equal. The 2-inch wide tape shall be APWA green and reverse printed bearing the identification of the sewer line below it and a warning such as "CAUTION."

The tape shall be buried 4-6 inches. After trench backfilling, the tape shall be placed in the backfill and allowed to settle into place with the backfill.

W-15.05 Mechanical Joints for Ductile Iron Pipe

In making up mechanical joints, the spigot shall be centered in the bell. The surface with which the rubber gasket comes in contact shall be cleaned thoroughly and the gasket shall be washed thoroughly with soapy water just prior to assembly of the joint. The gasket and gland shall be placed in position, the bolts inserted, and the nuts tightened fingertight. The nuts then shall be tightened by means of a torque wrench in such a manner that the gland shall be brought up evenly into the joint. The following range of bolt torques shall be applied:

Bolt Size Inches	Range of Torque Foot-Pounds
5/8	45 - 60
3/4	75 - 90
1	80 - 100
1-1/4	105 - 120

If effective sealing is not obtained at the maximum torque listed above, the joint shall be disassembled and reassembled after a thorough cleaning.

All bolts and nuts shall be field coated with a bituminous coating after assembly of the joint.

W-15.06 Push-on Joints for Ductile Iron Pipe

In making up push-on joints, the gasket seat in the socket shall be cleaned thoroughly and the rubber gasket shall be wiped clean with a cloth. The gasket shall be placed in the socket and a thin film of lubricant shall then be applied to the inside surface of the gasket that will come in contact with the entering pipe. The plain end of the pipe to be entered shall be cleaned thoroughly and placed in alignment with the bell of the pipe to which it is to be joined. The joint shall be made up by exerting sufficient force on the entering pipe so that its plain end is moved past the gasket until it makes contact with the base of the socket.

W-15.07 Joining Clay Pipe

The joining of clay pipe with flexible plastic joints shall be done in accordance with the manufacturer's instructions. The joint surface on both the bell and spigot ends shall be wiped clean and coated with a lubricant furnished by the manufacturer to facilitate assembly. The spigot end shall be inserted in the bell and pressure applied sufficient to seat the pipe properly. After the joint has been completed, any voids in the excavation beneath the spigot shall be thoroughly tamped full of granular fill material to provide a full bearing for the pipe and prevent excessive pressure on the bottom of the joint.

W-15.08 Joining of PVC Pipe-Gravity

The assembly of gasketed joints shall be performed as recommended by the pipe manufacturer. In all cases clean the gasket and bell, especially the groove area and the spigot area, with a rag, brush or paper towel to remove any dirt or foreign material before the assembly. Lubricant shall be applied as specified by the pipe manufacturer.

Align the spigot to the bell and insert the spigot into the bell until it contacts the gasket uniformly. Apply firm steady pressure either by hand or by bar and block assembly until the spigot easily slips through the gasket.

If undue resistance to insertion of the pipe end is encountered or the reference mark does not position properly, disassemble the joint and check the position of the gasket. If it is twisted or pushed out of its seat ("rolled"), inspect components, repair or replace damaged items, clean the components, and repeat the assembly steps. Be sure both pipe lengths are in concentric alignment. If the gasket was not out of position, verify proper location of the reference mark.

To join field-cut pipe, first square cut the pipe end. Use a factory-finished beveled end as a guide for proper bevel angle and depth of bevel plus the distance to the insertion reference mark. Bevel the end using a pipe beveling tool or a wood rasp which will cut the correct taper. Round off any sharp edges on the leading edge of the bevel.

W-15.09 Joining Concrete Pipe

Before joining concrete pipe using flexible rubber gaskets, the joint surfaces of both the bell

and spigot (tongue and groove) ends shall be wiped clean. Any lumps, projections, burrs, or chips which would interfere with the proper compression of the gasket shall be repaired. The spigot or tongue end with the gasket in place and with all surfaces lubricated as recommended by the manufacturer, shall be inserted into the bell or groove. Pressure shall be applied to seat the pipe properly in the bell or groove. Voids under the pipe shall be tamped full of granular material to provide full bearing for the pipe.

Curves for reinforced concrete pipe sewers shall be constructed with standard pipe where the opening of the joint on the outside of the curve is less than 1/2 inch. Where greater opening of the joint would be required, the curves shall be constructed using beveled or radius pipe with standard joints.

Curves for reinforced concrete pressure pipe or prestressed concrete pipe shall be constructed with standard pipe sections, where the opening of the joint on the outside of the curve is less than 1/2 inch, or with beveled pipe, precast elbows or combination of these methods.

W-15.10 Concrete Pipe Rubber Gasket Joints

Rubber gaskets shall be of the O-ring type or equivalent cross section approved by the Engineer. The composition and properties of the gaskets for gravity flow sewers shall meet the requirements of ASTM Des: C 443.

Composition and properties for concrete pressure pipe gaskets shall meet the requirements of the specifications for the concrete pressure pipe with which the gasket will be used.

In making O-ring rubber gasketed joints, the gasket and the pipe socket shall be lubricated with an approved rubber gasket lubricant, and the gasket shall be stretched over the spigot and placed accurately in position. The tongue or spigot end shall be carefully centered in the socket of the preceding pipe so as to avoid displacement of the gasket, and the pipe shall be drawn home fully compressing the gasket. Adjustments to line and grade shall be made in such a manner that the compressed rubber gasket will not be disturbed. Before proceeding with backfilling, the joint shall be felt completely around to determine whether the gasket is in its proper position. If the gasket can be felt out of place, the pipe shall be withdrawn and the gasket examined for cuts or breaks. If the gasket has been damaged, it shall be replaced with a new one before the pipe is replaced.

Rubber gaskets shall be stored in a cool place and protected from light, sunlight, heat, oil, or grease until installed. Any gaskets showing signs of checking, weathering, or other deterioration will be rejected.

W-15.11 Temporary Bulkheads

At the ends of contract sections, where adjoining pipelines have not been completed, and in connections built into pipelines where adjoining pipelines or structures have not been completed and are not ready to be connected, temporary bulkheads, approved by the Engineer, shall be built. Such bulkheads encountered in connecting sewers or structures included in the Contract, or pipelines or structures previously built, shall be removed by the Contractor when the need for them

has passed or when ordered by the Engineer.

W-15.12 Testing

The testing of pipelines shall be done in accordance with the requirements of the Workmanship and Materials section headed "Leakage Tests."

W-15.13 Joining Different Types (Clay, PVC, or Ductile Iron) of Pipe

The joining of clay pipe to ductile iron pipe or clay pipe to PVC pipe, shall be accomplished with flexible compression couplings. Couplings shall include stainless steel shear rings and stainless steel compression bands. Such couplings shall meet the requirements of ASTM DES: C 425, ASTM C1173 and shall be Series No. 1002 flexible polyvinyl chloride couplings with stainless steel compression bands and shear rings as manufactured by Fernco Joint Sealer Co., Ferndale, Michigan; Band-Seal couplings as manufactured by Mission Clay Products Corp., Whittier, California; or approved equal. After the joint has been completed, any voids in the excavation beneath the coupling shall be thoroughly tamped full of granular fill material to provide a full bearing for the pipe and prevent excessive pressure on the bottom of the joint.

The joining of SDR-35 or SDR-26 PVC pipe to ductile iron or C-900 PVC pipe, shall be accomplished with rigid PVC C900 x SDR-35 adapter couplings. Such couplings shall be molded of PVC material meeting ASTM D-1784 specifications. Joints shall meet ASTM D-3213 requirements with gaskets conforming to ASTM F-477. The adapter couplings shall be manufactured by Harco, Lynchburg, VA, or equal. Installation of rigid couplings shall be done in accordance with the manufacturer's instructions. After the joint has been completed, any voids in the excavation beneath the coupling shall be thoroughly tamped full of granular fill material to provide a full bearing for the pipe and prevent excessive pressure on the bottom of the joint.

W-15.14 Connection to Manholes

The Contractor will be required to submit a shop drawing, detailing the method of connecting the proposed pipe to the manhole and making it watertight:

1. For connecting vitrified clay or ductile iron pipe, the Contractor shall use nonshrink grout to seal the opening between the pipe O.D. and manufactured opening in the manhole or flexible rubber boot, precast into the manhole. The boot shall have stainless steel bands to compress and seal to the proposed pipe or shall be a compression type, such as A-Lock.

2. For connecting PVC pipe, the Contractor shall use a flexible rubber boot, precast into the manhole. The boot shall have stainless steel bands to compress and seal to the proposed pipe or shall be a compression type, such as A-Lock. Should the flexible rubber boot need to be relocated or when connecting to an existing manhole, the Contractor shall perform the connection by one of two methods. The preferred method is to core the manhole and install a rubber boot. The rubber boot shall be manufactured by Kor-n-Seal, or equal. The boot shall be installed and the

PVCP connection shall be in accordance with the manufacturer's instructions. If the manhole cannot be cored or if the manhole is constructed of brick, the connection shall be made with a PVC manhole adapter which has an exterior impregnated silica surface layer. The adapter shall be manufactured by GPK Products, Inc., Fargo, ND, or equal. The adapter shall be installed and grouted into the manhole wall in accordance with the manufacturer's instructions with nonshrink grout. The PVCP shall be inserted through the adapter.

W-15.15 Joint Grouting

Joints for concrete pipelines using rubber gaskets and steel end rings shall be grouted on the outside with cement mortar composed of one part Type IA portland cement to one part sand by volume. The materials shall be thoroughly mixed to produce a uniform mortar with all aggregate particles well coated.

The joint grouting shall not advance closer than two pipe lengths to the laying operations. In grouting the joint, a cloth diaper shall be used to encase the outside diameter of the bell of the pipe and adequately straddle the joint recess so as to keep out dirt and to serve as a form for grouting. The joint space shall be filled with cement mortar, just thin enough to run around the joint. The diaper is to be left in place permanently. Before the mortar has taken its initial set, the diaper shall be examined, and if not completely filled, additional mortar shall be forced into the joint.

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SECTION 18 - LEAKAGE TESTS

W-18.01 General

All pipelines will be tested and inspected for infiltration or leakage by the Engineer with the assistance of the Contractor prior to final acceptance of the work. All tests and inspections will be conducted in a manner to minimize as much as possible any interference with the Contractor's work or progress.

The Contractor shall notify the Engineer when the work is ready for testing and inspecting, and tests and inspections shall be made as soon thereafter as practicable under the direction of the Engineer. Personnel for reading meters, gauges, or other measuring devices will be furnished by the Engineer. The Contractor shall furnish all other labor, materials, services, and equipment, including power, fuel, meters and gauges, pumps, bulkheads, backflow preventers, water, and other items and apparatus necessary for making leakage tests, preparing pipelines for testing, assembling, placing, and removing testing equipment, and placing pipelines in service, all to the satisfaction of the Engineer. Only City water shall be used for testing unless otherwise approved by the Engineer. The water shall be obtained and metered from sources approved by the Engineer. After testing, the water shall be disposed of by the Contractor into storm sewers or drainage courses approved by the Engineer.

W-18.02 Tests of Sewer - General

All sewers shall be tested for infiltration or leakage after completion of backfilling. All wyes, house connections, and stubs shall be suitably plugged or bulkheaded to the satisfaction of the Engineer prior to testing. All sewers shall be cleaned and pumped out as necessary prior to testing.

Sewers shall be tested for infiltration, unless otherwise ordered by the Engineer. If the Engineer determines that groundwater conditions are not suitable for infiltration testing, sewers shall be tested for leakage. Sewers may be tested for leakage by measuring leakage out of the sewer or by air testing. The length of sewer to be tested shall be subject to prior approval by the Engineer.

The length of house connections, if any, will be included in the total length of sewer under test when computing infiltration or leakage.

All testing equipment and the arrangement of such equipment shall be subject to the prior approval of the Engineer. Sections of sewers under test shall be arranged to prevent the internal pressure on any joint from exceeding 10 psi.

Refer to Section 11 - PVC Pipe Gravity for specific requirements for infiltration and leakage testing for PVC gravity pipe.

W-18.03 Infiltration Test of Sewers

Infiltration tests shall be performed when the groundwater level is a minimum of 2 feet

above the crown of the sewer at the highest point in the test section. No such tests shall be started until the infiltration conditions are established in the work to be tested. The Contractor shall provide suitable
observation wells along the line of the work or other approved means to determine the groundwater level.

Infiltration tests will be made by measuring the infiltrated flow of water over a measuring weir set up in the invert of the sewer a distance, as approved by the Engineer, from a temporary bulkhead or other limiting point of infiltration. Testing shall be for a minimum period of 4 hours. The quantity of infiltration for any section of the sewer shall not exceed 50 gallons/mile/day/inch of pipe diameter.

W-18.04 Leakage Test of Sewers

Leakage tests shall be performed by bulkheading the section of sewer under test at the manhole, at the lower end, and filling the sewer with clear water until the water level is up a minimum of 2 feet above the crown of the sewer or a minimum of 2 feet above the groundwater level, whichever is greater, in the manhole at the highest point in the section. Leakage will be the measured amount of water added to maintain the level in the higher end manhole. Tests shall be carried on a minimum of 4 hours with readings at 30-minute intervals. The quantity of leakage for any section of the sewer shall not exceed the limits specified for infiltration in the subsection headed "Infiltration Test of Sewers."

W-18.05 Air Leakage Test of Sewers

Air pressure leakage tests shall be limited to sewers 30 inches in diameter and smaller. The maximum allowable air leakage is based on prewetted pipe walls. The contractor may, therefore, fill the pipe with clear water and then empty the pipe prior to air testing. When pipe walls are prewetted, air leakage tests shall be completed within 24 hours after filling the sewer section to be tested.

Air pressure tests shall be made by placing the sewer under 3.0 psig air pressure and measuring the volume of air required to maintain this pressure. The rate of air leakage shall be determined when the system reaches an equilibrium state and air flow shall be read by means of an approved rotameter.

The maximum rate of air loss shall be 0.003 cfm per square foot of interior pipe surface, and the maximum air flow shall not exceed 2.0 cfm when the total pressure on the sewer is maintained at 3.0 psig. When the groundwater level is above the invert of the sewer, but below a level adequate for infiltration testing, the maximum air loss shall be reduced 6 percent for each foot of groundwater above the sewer invert.

Air testing equipment shall be arranged so that compressors, valving, gauges, and other test devices are located at the ground surface. Air testing equipment shall have an approved air relief arrangement to prevent the sewer from being pressurized to greater than 10.0 psig.

W-18.06 Leakage Tests of Force Mains

Force mains shall be tested as a whole or in sections valved or bulkheaded at the ends. The mains shall be tested under an average hydrostatic pressure of not less than 100 pounds per square inch, unless otherwise indicated in the Specific Provisions. The pressure shall be applied to the pipeline through a tap in the pipe by means of a hand pump or other method and shall be maintained for a minimum of 4 hours. Air shall not be used for testing force mains.

The leakage for all force mains, as determined by the above test, shall not exceed the allowable leakage for iron water mains as given by the following formula in Section 4.2.2. of AWWA Specification C600:

$$L = \frac{SD/P}{133{,}200}$$

in which L is the allowable leakage, in gallons per hour, S is the length of force main tested in feet, D is the nominal diameter of the pipe in inches, and P is the average test pressure in psi gauge.

During the test, each valve shall be operated through several complete cycles of closing and opening. In addition, each valve, when in the closed position, shall have the test pressure applied to one end of the valve only. Each end of the valve shall be tested in this manner. There shall be no visible leakage through the valves, and the valves shall not show any evidence of structural distress.

All harnessed sections of the buried force main shall be completely backfilled before such sections are tested.

W-18.07 Repairing Leaks

When infiltration or leakage occurs in excess of the specified amount, defective manholes, pipe, pipe joints, or other appurtenances shall be located and repaired at the expense of the Contractor. If the defective portions cannot be located, the Contractor, at his own expense, shall remove and reconstruct as much of the original work as necessary to obtain a sewer or force main within the allowable infiltration or leakage limits upon such retesting as necessary and directed by the Engineer.

* * *

SECTION 27 - DEMOLITION

W-27.01 General

Demolition includes all work necessary for the removal and disposal of masonry, steel, reinforced concrete, plain concrete, wastewater equipment, piping, electrical facilities, and any other material or equipment shown or specified to be removed. Dust control shall be provided and provision made for safety.

Demolition shall be carried out in such a manner that adjacent structures, which are to remain, shall not be endangered. The work shall be scheduled so as not to interfere with the day to day operation of the existing facilities, all in accordance with the Sequence of Operations specified in the Specific Provisions. Doorways or passageways in existing facilities shall not be blocked.

Care shall be taken to assure that concrete shall be broken and removed in reasonably small masses. Where only parts of a structure are to be removed, the concrete shall be cut along limiting lines with a specially designed saw so that damage to the remaining structure is held to a minimum.

W-27.02 Requirements Prior to Demolition

The Contractor shall visit the site and inspect all existing structures. Special care shall be taken to observe and record any defects, which may exist in buildings or structures adjacent to but not directly affected by the demolition work. Prior to commencing the demolition, the Contractor shall provide the Engineer with a copy of this inspection.

Drawings of existing structures and equipment will be available for inspection by the Contractor at the office of the Engineer and Owner.

Warning signs, protection barriers and red warning lights shall be provided as necessary adjacent to the work as approved by the Engineer and shall be maintained during the demolition period.

Demolition work shall not be undertaken until all mechanical and electrical services affected by the work have been properly disconnected. Interconnecting piping or electrical services that are to remain in service either permanently or temporarily shall be capped, rerouted or reconnected in a manner that will not interfere with the operation of the remaining facilities.

Where the presence of hazardous chemicals, gases, flammable materials or other dangerous substances is apparent or suspected, testing and purging shall be performed and the hazard eliminated before demolition is started.

W-27.03 Requirements During Demolition

The use of explosives will not be permitted.

All mechanical and electrical equipment shall be carefully protected against dust and debris.

All debris shall be removed from the structures during demolition and not allowed to accumulate in piles.

Safe access to and egress from all working areas shall be provided at all times with adequate protection from falling material.

Adequate scaffolding, shoring, bracing and protective covering shall be provided during demolition to protect personnel and equipment against injury or damage. Floor openings not used for material drops shall be covered with material substantial enough to support any loads placed on it. The covers shall be properly secured to prevent accidental movement.

Adequate lighting shall be provided at all times during demolition.

Areas below demolition work shall be closed to workmen while removal is in progress.

No material shall be dropped to any point lying outside the exterior walls of the structure unless the area is effectively protected.

No workmen shall stand on any wall to remove material except when adequate staging or scaffold protection is provided at a distance not exceeding 12 feet below the top of such walls and other reasonable precautions are taken. Whenever a workman is required to work at a height of more than 12 feet above a floor, platform, scaffold or the ground, he shall be equipped with a safety belt with a life line attached.

W-27.04 Disposal of Materials

All debris, rubbish, scrap pieces, equipment, and materials resulting from the demolition shall become the property of the Contractor and shall be removed from the site, except for the items designated by the Engineer to be salvaged.

* * *

SECTION 30 - MISCELLANEOUS PIPE AND FITTINGS

W-30.01 General

Miscellaneous pipe and fittings include polyvinyl chloride (PVC) pipe, copper pipe, steel pipe, and plastic tubing.

W-30.02 Polyvinyl Chloride Pipe

Polyvinyl chloride (PVC) pipe shall be Schedule 80 minimum meeting the requirements of ASTM Des: D 1785, 1254B. All joints and fittings shall be threaded except where flanged joints are shown or required for connection to other piping. Threaded PVC fittings shall be socket welding type, 150-pound class, conforming to ASTM Des: D 2467 and D 2657.

W-30.03 Copper Pipe

Copper pipe shall be Type K or L hard-drawn copper tubing and shall meet the requirements of ASTM Des: B 88.

Fittings shall be of the streamlined, solder joint type, and shall meet the requirements of ANSI Specifications B16.22.

W-30.04 Steel Pipe

Steel pipe shall be galvanized, meet the requirements of ASTM Des: A 53 and shall not be less than Schedule 40. Dimensions of steel pipe shall conform to ANSI B36.10.

Fittings for steel pipe shall be galvanized and shall be made to standard dimensions or as shown. Fittings used in pipelines 2□ inches in diameter or smaller shall be of the screwed pattern and shall be of malleable iron meeting the requirements of ASTM Des: A 197. The fittings shall conform to ANSI B 16.3. Where galvanized fittings are shown or specified, galvanizing shall meet the requirements of ASTM Des: A 120. Steel flange fittings shall meet the requirements of ANSI B 16.5 for 150-pound standard, except that the flanges shall be plain faced.

All flanges for steel pipe, except blind flanges, shall be of the slip-on welding type with hubs meeting the requirements of AWWA C207 Class B, D, or E suitable for the size of pipe and test pressures specified, and conforming to the requirements of ASTM Des: A 181, Class 1. The flanges shall be attached to the barrel of the pipe with two continuous fillet welds. The flanges shall be attached to the barrel of the pipe with two continuous fillet welds. Blind flanges shall be plain faced and shall conform to ANSI B 16.5, Class 150. All flanges shall be covered and protected during delivery and storage.

Flanged joints shall be made with bolts or bolt studs with a nut on each end. Bolts, stud bolts, and nuts shall meet the requirements of ASTM Des: A 307, Grade B and ANSI B 16.1 unless noted otherwise on the Plans.

Gaskets for flanged joints shall be of rubber with cloth insertion of the full face type meeting the requirements of ANSI B 16.21 and shall be those made by the Garlock Packing Company, Crane Company, U.S. Rubber Company, or equal. Gaskets shall be 1/16 inch thick.

Zinc for galvanizing, zinc coating, and plating shall meet the requirements of ASTM Des: B 6 and shall be at least equal to the grade designated as "Prime Western."

Wrought metals and castings shall be sandblasted or ground smooth. When a smooth coat is required, castings shall be tumbled and all high spots ground flush. Castings shall be normalized to prevent cracking.

Base metal shall be thoroughly cleaned, using only approved solvents and wire brushes, after which it shall be pickled.

Products to be galvanized shall be safeguarded against embrittlement in accordance with ASTM Des: A 143 and against warpage and distortion in accordance with ASTM Des: A 384.

Galvanizing shall be done by the hot-dip process after fabrication, unless otherwise specified in conformance with the appropriate ASTM and American Hot Dip Galvanizers Association, Inc. specifications. The dipping shall not come in contact with or rest upon the dross during the operation.

Galvanizing and coating shall be done in a plant having sufficient facilities to produce the quality of coatings herein specified and ample capacity for the volume of work required. Galvanized material shall be shipped and handled in a manner which will avoid damage to the zinc coating.

Galvanizing shall meet the requirements of ASTM Des: A 120.

W-30.05 Plastic Tubing

Plastic tubing for the air supply line shall be clear vinyl instrument grade tubing with an inside diameter of 3/8 inch and a minimum wall thickness of 0.062 inch. The tubing shall be FAST & TIGHT, Formula PV-2 as manufactured by Parker Hannifin, Kent, Ohio, or equal.

W-30.06 Workmanship

Working drawings, delivery, erection, testing, insulation, and disinfection of miscellaneous pipe and fittings shall meet the applicable portions of similar requirements for ductile iron pipe specified under the respective sections of Workmanship and Materials.

* * *

SECTION 31 - HANGERS AND SUPPORTS

W-31.01 General

Hangers and supports shall include all hanging and supporting devices of metallic construction shown, specified, or required for pipelines, apparatus, and equipment other than electrical equipment. The Contractor's working drawings, as required by the General Provisions hereof, shall show the quantity, type, design, and location of all hangers and supports required.

W-31.02 Materials

Structural and miscellaneous steel, iron castings, cast-iron pipe, and steel pipe used for hangers and supports shall meet the requirements of the applicable Workmanship and Materials sections.

W-31.03 Design

Hangers and supports not detailed on the Drawings shall be adequate to maintain the pipelines, apparatus, and equipment in proper position and alignment under all operating conditions with due allowance for expansion and contraction, and shall have springs where necessary. Hangers and supports shall be of standard design where possible, and be best suited for the service required, as approved by the Engineer. Where required, they shall be screw adjustable after installation.

Supporting devices shall be designed in accordance with the best practice and shall not be unnecessarily heavy. Sufficient hangers and supports shall be installed to provide a working safety factor of not less than five for each hanger.

All supporting devices shall be designed as to minimize interference with access and movement. The injury hazard shall be considered and minimized in all protruding supporting devices.

On pipes which are covered with heating insulation, hangers and supports shall include proper pipe protection saddles.

Overhead hangers shall be supported by threaded rods properly fastened in place by suitable screws, clamps, inserts, or bolts, or by welding.

Brackets for the support of piping from walls and columns shall be made of welded steel and shall be designed for three maximum loads classified as follows:

Light	750 pounds
Medium	1,500 pounds
Heavy	3,000 pounds

When medium or heavy brackets are bolted to walls, backplates of adequate size and thickness shall be furnished and installed to distribute the load against the wall. When the use of backplates is not practicable, the brackets shall be fastened to the wall in such a manner that the safe bearing strength of the wall will not be exceeded.

Pipe rolls or chairs shall be of the cast-iron type. Pipe rolls shall be provided with threaded nuts or with sockets to take threaded rods.

Saddle stands shall be of the adjustable type. Each stand shall consist of a length of steel pipe fitted at the base with a standard threaded cast-iron flange and at the top with an adjustable saddle or roll. The base flanges shall be bolted to the floor foundation or concrete base.

Stanchions shall be of similar construction to the saddle stand, except that they shall be fitted at the top with cast-iron pipe saddle supports or with pipe stanchion saddles with yokes and nuts.

Where adjustable supporting devices are not required, pipelines 3 inches in diameter and smaller may be supported on cast-iron, malleable iron, or steel hook, hook plates, rings, or ring plates.

W-31.04 Anchors

Anchors shall be furnished and installed when specified, shown, or required for holding the pipelines and equipment in position or alignment. Anchors shall be designed for rigid fastening to the structures, either directly or through brackets. The design of all anchors shall be subject to approval by the Engineer.

Anchors for piping shall be of the cast-iron chair type with steel straps, except where anchors form an integral part of pipe fittings or where an anchor of special design is required.

W-31.05 Inserts

Inserts for concrete shall be galvanized and shall be installed in the concrete structures where required for fastening supporting devices. They shall be designed to permit the rods to be adjusted horizontally in one place and to lock the rod nut or head automatically. Inserts shall be recessed near the upper flange to receive reinforcing rods. Inserts shall be so designed that they may be held in position during concrete placing operations. Inserts shall be designed by the rod which they engage.

W-31.06 Painting

Hangers, supports, anchors, and similar devices shall be painted in accordance with the Workmanship and Materials section headed "Painting."

* * *

SECTION 58
SEWAGE PUMPING EQUIPMENT

W-58.01 General

The sewage pumping equipment shall include pump, motor, adjustable frequency drive and all control equipment to provide a complete pumping system for Pump Nos. 1, 2 and 3. Refer to a related specification section titled "Adjustable Frequency Drives". Vibration monitoring sensors shall be provided and installed on all pumps and all motors. Vibration testing for the pump and motor assembly shall be performed as specified in the Specific Provisions section titled "Vibration Requirements for Rotating Equipment".

Pumps shall be manufactured by Fairbanks Nijhuis Pump (Pentair). The Fairbanks Nijhuis Pump supplier (Sanders Company, Inc. – (772) 285-5483) shall be responsible for the following:

1. Furnishing the pump(s) complete with motor, adjustable frequency drives, motor high ring base with guard, intermediate shafting, necessary guards and all other specified accessories and vibration monitoring equipment for the non-clog, closed-coupled style dry pit sewage pumps. Pumps are to be connected to drivers by suitably sized solid type intermediate shafting with steady bearings and shaft guards as required.

2. Providing guidance and inspection for the installation of the new pumping equipment.

3. Testing and training for the new sewage pumping system.

It is the intent of these specifications that all pumping equipment for Pump Nos. 1, 2 and 3 be functionally identical.

Shop drawings and product data, shall include the following:

1. Certified dimensional drawings of each item of equipment and auxiliary apparatus to be furnished.

2. Certified foundation, pump support, and anchor bolt plans and details.

3. Schematic electrical wiring diagram and other data as required for complete pump installation.

4. Literature and drawings describing the equipment in sufficient detail, including parts list and materials of construction, to indicate full conformance with the detail specifications.

5. Total weight of pumping unit, separately identifying the weight of the pump and the drive.

W-58.02 Quality Assurance

To assure unity of responsibility, the pumps, drives, motors, motor high ring base, adjustable frequency drive and sole plates, shall be furnished and coordinated by the pump manufacturer. The Contractor and manufacturer shall assume responsibility for the satisfactory installation and operation of the entire pumping system including pumps, motors, sole plates, and controls as specified.

The equipment covered by these specifications is intended to be standard pumping equipment of proven ability as manufactured by concerns having extensive experience in the production of such equipment. A single manufacturer shall furnish units specified herein. The equipment furnished shall be designed, constructed, and installed to operate satisfactorily when installed as shown on the drawings.

Pumps shall be manufactured in accordance with the Hydraulic Institute Standards, except where otherwise specified herein.

The pump manufacturer shall be fully responsible for the design, arrangement, and operation of all connected rotating components, including soleplate(s), if any, of the assembled pumping unit mounted on a fabricated steel base plate, to ensure that neither harmful nor damaging vibrations occur at any speed within the specified operating range.

W-58.03 Delivery, Storage and Handling

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 unit and equipment are ready for operation.

All equipment and parts must be properly protected against any damage during shipment. Contractor shall store equipment in accordance with the manufacturer's instructions.

Factory assembled parts and components shall not be dismantled for shipment unless permission is received in writing from the Engineer.

The finished surfaces of all exposed flanges shall be protected by wooden or equivalent blank flanges, strongly built, and securely bolted thereto.

Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.

No shipment shall be made until approved by the Engineer in writing.

For protection of bearings during shipment and installation, the bearing shall be properly processed. Anti-friction bearings, if prelubricated, shall be protected in accordance with the bearing manufacturer's recommendations against formation of rust during a long period of storage while awaiting completion of installation and start-up of the machine in which they are used. Anti-friction bearings, which are not prelubricated, shall be properly treated in accordance with the bearing manufacturer's recommendation against formation of rust during a long period of storage while waiting completion of installation and start-up by the application of Exxon Rust-Ban No. 392, or equal treatment.

W-58.04 Pump Characteristics

The pump shall be a vertical closed-coupled, dry pit, single stage, split case centrifugal pump with a single bottom suction and a side discharge with a clockwise rotation. The pump shall be a Fairbanks Morse 20-inch Model 2444 with an L20E1A impeller. A Letter of Standardization for the pump manufacturer has been included in the Contract documents and no other pump manufacturer will be considered.

The pumping unit shall be variable speed and designed for operating under the following conditions:

Number of Units		3 (2 operating, 1 standby)
Rating Capacity:		
Motor at 100% Speed	(505 rpm)	23.0 MGD at 29.7 ft, TDH
Motor at 75% Speed	(379 rpm)	15.5 MGD at 19.8 ft, TDH
Motor at 50% Speed	(253 rpm)	6.6 MGD at 12.4 ft, TDH
Minimum pump efficiency at rated conditions		
With motor at 100% speed		79%
Approx. shut-off head at 100% speed		60 ft
Horsepower		250
Max. Speed		505 rpm
NPSHr at max speed		14.6 ft @ 22.8 MGD
Pump suction diameter:		24 in
Pump casing discharge diameter:		20 in

Where total head (TH) is referred to in conjunction with the specified discharge requirements, it shall be understood to consist of the sum of the pressure head plus the velocity head, in feet, at the discharge nozzle of the pump minus the pressure head and the velocity head at the suction nozzle of the pump. The efficiency of the pump shall be understood to be based upon total head as just defined.

The pumps shall operate throughout the entire operating range, within the vibration limits specified herein. The pump and its driving equipment shall be designed and constructed to successfully withstand a maximum turbining speed of the unit resulting from backflow through the pump of 100 percent of the design operating speed.

W-58.05 Rotation

The pump shall have clockwise rotation when viewed from the driver end looking at the pump.

W-58.06 Impeller

The impeller shall be a Fairbanks Morse, model number L20E1A impeller. The impeller shall be balanced non-clogging type made of ASTM –A748-CA-6NM class B cast stainless steel. The impeller shall be of one-piece, single-suction, enclosed, three-vane, mixed flow design with well-rounded leading vanes and then tapered toward the trailing edge for a circular flow pattern. The waterways through the impeller will have extremely smooth contours, devoid of sharp corners so as to prevent rags or stringy, fibrous material from catching or clogging. The impeller shall be balanced and secured to the shaft by means of a bolt, washer, and key. The arrangement shall be such that the impeller cannot be loosened from torque in either forward or reverse rotation. Impeller shall be supplied with axial removable stainless steel wear ring. Wear ring shall be approximately 50 Brinell softer than the fronthead wear ring.

W-58.07 Volute/Casing

The volute shall be matched to the impeller and made of close-grained cast iron conforming to ASTM A48 Class 30. The volute is to be of one-piece circular constant flow, equalizing pressure design with smooth fluid passages large enough to pass any size solid that can pass through the impeller. The casing and impeller geometry shall be such that the rated size solid capability of the pump will pass the same size solid between the full diameter impeller and the cutwater passage. The volute shall be side flanged tangential discharge and capable of rotation in 45º increments to accommodate piping orientation. Diffusion vanes are not permitted. The volute shall be furnished with large cleanout openings located at the impeller centerline, to allow access to the impeller. Volute priming, drain, and 1/2" minimum gauge connections shall be provided. A 2" priming connection shall be located at the top of the volute, above the centerline. Flanges shall be 125 pounds flat-faced flanges per ANSI drilling. The casing shall be designed to permit the removal of the rotating assembly without disturbing the suction or discharge piping. The pump casing shall be hydrostatically tested to 1.5 times the design head or 1.25 times the shutoff head, whichever is greater. The minimum case wall thickness shall be 1.125".

The volute shall be provided with a cleanout located on side opposite to discharge pipe as shown on the plans.

A 2" connection for vacuum priming valve shall be integrally casted to the top of the volute located on the side opposite to the discharge at the location shown on the plans.

The pump suction shall be supplied with a 24" fronthead connection. The discharge shall be a 20" connection, and the minimum case wall thickness shall be 1.125 inches.

The pump shall be supplied with a 2 sole plates, minimum 2" thick. Sole plates will rest fully on the concrete piers as shown on the plans.

W-58.08 Fronthead

The front head shall be made of close-grained cast iron conforming to ASTM A48 Class 30. The front head shall be cast separately and be connected to the suction elbow. Front head casing shall be protected from grit erosion by a 'Grit Shield" combination 600 Brinell high chrome iron wear ring and angular cast plate. The "Grit Shield" shall utilize "speed bumps" on the circumference to break up the half speed grit and sand rotation occurring in the front head area.

Fronthead shall be provided with optional hand hole to facilitate cleaning.

W-58.09 Backhead

A separately cast close-grained cast iron back head with large access openings and integral sealing box conforming to ASTM A48 Class 30 shall be provided. The sealing box shall be cast integrally with the backhead and be designed to accommodate either packing or mechanical seal without re-machining. The sealing box shall be drilled and tapped for external flushing with seal cage. A ¾" minimum backhead drain tap shall be provided. Sealing box leakage will be collected by the backhead drain trough and piped directly to drain, eliminating any drippage to the floor. A minimum of two rings of graphite-impregnated synthetic packing and a split Teflon water seal ring shall be furnished. Glands shall be two-piece split interlocking, made of cast iron (bronze), held in place by studs and nuts.

Mechanical seal drainage pipe shall be provided with an electrically actuated solenoid ball valve to prevent loss of vacuum priming through mechanical seal.

W-58.10 Bearing Frame Assembly

The bearing housing shall be close-grained cast iron conforming to ASTM A48 CL30 and of heavy, rugged design for carrying the bearings and machined for accurate and permanent bearing alignment completely enclosing the shaft between the bearings. Bearing supports are to be of heavy-duty construction providing for self-centering fit with the casing for proper alignment. The bearing housing shall be of dust-proof design, incorporating lip-type grease seals in contact with the shaft to prevent the entrance of contaminants. Zerk-type grease fittings for bearing lubrication shall be supplied at the bearing housing.

The pump shaft shall be made from type 4140 alloy steel, of sufficient diameter to carry the maximum loads imposed and to prevent vibration and fatigue. The shaft shall be accurately machined along its entire length. Keyways shall be provided at both ends.

A renewable shaft sleeve, positive adhesive sealed to prevent leakage between the shaft and the sleeve, shall protect the shaft through the sealing box area. The shaft sleeve shall be stainless steel with Brinell hardness of 300-350.

Radial (inboard) bearings shall be grease-lubricated spherical roller type, self-aligning, designed to carry the hydraulic radial loads encountered in the service conditions. Thrust (outboard) bearings on the 12" pumps shall be grease-lubricated angular contact, duplex mounted, designed to carry the pump hydraulic axial and dead load thrust. The 16" & 20" pumps thrust bearings shall be grease-lubricated tapered roller type.

Bearings shall be designed for an L10 life of 100,000 hours per AFBMA at best efficiency point. Grease relief ports with plugs shall be provided.

W-58.11 Mechanical Seal

The pump sealing box mechanical seal shall be a Chesterton 442-50, 6.25" Seal, CR/CB-Viton or shall meet Chesterton's published specifications for this unit.

A throat bushing shall be used in conjunction with the mechanical seal. The throat bushing shall be a Spiral Trac Adaptor bushing, CWS version and shall be designed for use without flush water, or shall meet EnviroSeal's published specifications for this unit.

W-58.12 Fits and Hardware

The volute/casing, fronthead, backhead, and frame shall be manufactured with concentric shoulder fits to assure accurate alignment. All machined bolts, nuts, and cap-screws shall be of the hex-head type and will not require the use of any special tools.

W-58.13 High Ring Base

The motor high ring base shall be cast iron or fabricated steel of adequate height to permit access to the coupling and furnished with a shaft guard.

W-58.14 Electric Motors

The electric motors for the pumps shall be as specific in Section 26 27 19.19, (Electric Motors). Motors shall be type Weather Protected.

W-58.15 Vibration Monitoring Equipment

General:

The Vibration Monitoring Equipment shall consist of two components, an accelerometer mounted on the machinery, and an electronic signal conditioner / transmitter mounted adjacent to the machinery. The raw signal from the accelerometer shall be integrated by the signal conditioner to obtain a velocity signal— the peak amplitude shall be locally displayed, and also provided as a 4-20mA signal for analog recording. The monitor shall have both a vibration alert and danger relay to facilitate annunciation and machine shut down respectively.

The Vibration Monitoring Equipment shall be provided, and the accelerometers installed, by the pump supplier. The transmitters shall be mounted and wired by the electrical subcontractor.

Acceptable Manufacturers:

The Vibration Monitoring Equipment shall be by Connection Technology Center, Inc. (CTC), or equal.

Ratings, Characteristics and Features:

The Vibration Monitoring Equipment shall have the following ratings, characteristics, and performance features:

The Vibration Transmitter shall be 2-channel to allow for monitoring of both pump and motor vibration.

Vibration Transmitter shall be provided with fiberglass enclosure and be powered by a single 120V source.

Vibration Transmitter shall be as manufactured by Connection Technology Center, Inc. (CTC), VP series, Model #VPR100-2L-V0-BB.

Accelerometers shall be 100mV/g type, CTC Model #AC102 with appropriate cables and connectors.

Installation:

Two complete Vibration Monitoring Systems shall be provided— one accelerometer shall be mounted on the motor and the second on the pump. The signal conditioners / transmitters shall be mounted in a common NEMA 4X enclosure located adjacent to the machinery as shown and required. The accelerometers shall be mounted after initial vibration testing to determine the best location to mount the permanent equipment.

The limits of vibration for the pumps and the motors shall be as described in the Specific Provisions.

W-58.16 Gauges

Each pump shall be provided with glycerin-filled suction and discharge pressure gauges with a 1/4-in NPT inlet and 4.5-in dials. A 316 stainless steel, oil filled, diaphragm with a 1/2-in NPT inlet, and 1/4-in flushing tap, with T-cock, shall be installed on each gauge. The suction gauges shall be of the compound type to indicate both vacuum and pressure and be graduated to read 15-psi positive pressures and 30-in mercury negative pressures. The discharge gauges shall be graduated from 0 to 60 psi. The pressure gauges shall be equal to Figure 1980 Solfrunt standard gauges, Model 150000-4 series, manufactured by Amtek, U.S. Gauge Division. The diaphragm seals shall be equal to Model MGSG0103102 seals manufactured by Amtek, Mansfield & Green Division. The gauges shall be connected to the pump suction and discharge. All fittings, bolting, and cocks shall be 316 stainless steel.

W-58.17 Shop Testing

A certified factory hydrostatic and performance test shall be performed on each new pumping (Pump Nos. 1, 2 and 3) in accordance with Hydraulic Institute Standards, latest edition. Tests shall be conducted with the pump in a vertical position. Tests shall be sufficient to determine the curves of head, input horsepower, and efficiency relative to capacity from shutoff to 150% of design flow. A minimum of six points, including shutoff, shall be taken for each test. At least one point of the six shall be taken as near as possible to each specified condition.

The Engineer shall have the right to witness the factory tests and inspect any equipment to be furnished under this Section prior to their shipment from place of manufacture. Notification of such test and a list of test equipment and procedures shall be furnished to the Engineer at least ten working days before the schedule test date.

Results of the performance tests shall be certified by a Registered Professional Engineer and submitted for approval before final shipment. A complete test report for each pump, including certified characteristic curves of the pump and certified copies of the hydrostatic test report, shall be submitted and approved by the Engineer before the pumps are shipped.

The pumping equipment and drive shall be tested in the field over the range of operation specified. The testing shall consist of operation of each adjustable frequency drive, motor, and pump. Tests shall be sufficient to determine the curves of head, input horsepower, and efficiency relative to capacity from shutoff to 150% of design flow. A minimum of six points, including shutoff, shall be taken for each test. At least one point of the six shall be taken as near as possible to each specified condition.

Vibration testing shall be performed as described in the Specific Provisions.

W-58.18 Spare Parts

Furnish the following spare parts for each size pump.

Quantity	Item
1 per pump	Impeller locknut
1 set per pump	Radial and thrust bearings
1 set per pump	Pump casing gaskets
1 per size of pump	Impeller
2 per size of pump	Upper wear ring
1 per size of pump	Grit shield
1 per pump	Mechanical seal & Spiral Trac Adaptor throat bushing
1 per size of pump	Rotating Assembly (impeller not mounted)
1 per size of pump	Fronthead assembly

* * *

SECTION 73–RESTRAINING DEVICES

W-73.01 General

Restraint devices for mechanical joint fittings and appurtenances conforming to either ANSI/AWWA C111/A21.11 or ANSI/AWWA C153/A21.53, shall conform to the following:

Restraint devices for nominal pipe sizes 3 inch through 36 inch shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10.

The devices shall have a working pressure rating equal to that of the pipe on which it is used but a minimum 100 psi. Ratings are for water pressure and must include a minimum safety factor of 2:1 in all sizes.

W-73.02 Material

Gland body, wedges and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536.

Ductile iron gripping wedges shall be heat treated within a range of 370 to 470 BHN.

Three (3) test bars shall be incrementally poured per production shift as per Underwriter's Laboratory (U.L.) specifications and ASTM A536. Testing for tensile, yield and elongation shall be done in accordance with ASTM E8.

Chemical and nodularity tests shall be performed as recommended by the Ductile Iron Society, on a per ladle basis.

W-73.03 Gaskets

Mechanical joint gasket shall be of a design that causes the gasket to deflect approximately 30% during assembly of the mechanical joint. The gasket material shall conform to the requirements of ANSI/AWWA C111/A21.11, section 11-6.4, of the latest revision.

W-73.04 Traceability

An identification number consisting of year, day, plant and shift (YYDDD) (plant designation) (Shift number), shall be cast into each gland body.

All physical and chemical test results shall be recorded such that they can be accessed via the identification number on the casting. These Material Traceability Records (MTR's) are to be made available, in hard copy, to the purchaser that requests such documentation and submits his gland body identification number.

Production pieces that are too small to accommodate individual numbering, such as fasteners and wedges, shall be controlled in segregate inventory until such time as all quality control tests are passed. These component parts may then be released to a general inventory for final assembly and packaging.

W-73.05 Installation

Mechanical joint restraint shall require conventional tools and installation procedures per AWWA C600, while retaining full mechanical joint deflection during assembly.

Proper actuation of the gripping wedges shall be ensured with torque limiting twist off nuts.

W-73.06 Approvals

Mechanical Joint Restraints shall be listed by Underwriters Laboratories in the 4 inch through 12 inch sizes.

Mechanical Joint Restraints shall be Factory Mutual Approved in the 4 inch through 12 inch sizes.

Mechanical Joint Restraints, 4 inch through 24 inch, shall meet or exceed the requirements of ASTM F1674 of the latest revision.

Mechanical joint restraint shall be Series 2000PV for PVC pipe and Series 1000 for DIP pipe produced by EBAA Iron Inc. or approved equal.

W-73.07 Coating System

Coating for restraint devices shall consist of the following:

All wedge assemblies and related parts shall be processed through a phosphate wash, rinse and drying operation prior to coating application. The coating shall consist of a minimum of two coats of liquid Xylan® fluoropolymer coating with heat cure to follow each coat.

All casting bodies shall be surface pretreated with a phosphate wash, rinse and sealer before drying. The coating shall be electrostatically applied and heat cured. The coating shall be a polyester based powder to provide corrosion, impact and UV resistance.

The coating system shall be MEGA-BOND by EBAA Iron, Inc. or approved equal. Requests for approved equal must submit coating material and process details for review.

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Procurement Guidelines To Implement Minority & Small Business Participation

Underutilized WMBE Primes by Industry Category

FORMAL PROCUREMENT

Construction	Construction-Related	Professional	Non-Professional	Goods
Black	Asian	Black	Black	Black
Hispanic	Native Am.	Hispanic	Asian	Hispanic
Native Am.	Woman	Asian	Native Am.	Asian
Woman		Native Am.		Native Am.
		Woman		Woman

Underutilized WMBE Sub-Contractors / Sub-Consultants

SUB WORK

Construction	Construction-Related	Professional	Non-Professional	Goods
Black	Black	Black	Black	Black
	Asian	Hispanic	Asian	Asian
	Native Am.	Asian	Native Am.	Native Am.
	Woman	Native Am.		Woman
		Woman		

Policy

The Guidelines apply to formal procurements and solicitations. WMBE participation will be narrowly-tailored.

Index

- Black = Black/African-American Business Enterprise
- Hispanic = Hispanic Business Enterprise
- Asian = Asian Business Enterprise
- Native Am. = Native American Business Enterprise
- Woman = Woman Business Enterprise (Caucasian)

Industry Categories

Construction is defined as: new construction, renovation, restoration, maintenance of public improvements and underground utilities.
Construction-Related Services are defined as: architecture, professional engineering, landscape architecture, design build, construction management services, or registered surveying and mapping.
Professional Services are defined as: attorney, accountant, medical doctor, veterinarian, miscellaneous consultant, etc.
Non-Professional Services are defined as: lawn maintenance, painting, janitorial, printing, hauling, security guard, etc.
Goods are defined as: all supplies, materials, pipes, equipment, machinery, appliances, and other commodities.

MBD Form-70

City of Tampa
Official Letter of Intent
(Form MBD-40)

A Letter of Intent is required for each WMBE/SLBE listed on the Schedule of Subcontractors to be Utilized (MBD 20 Form). Letter of Intent must be signed by both the Bidder/Service Provider and WMBE/SLBE firm.

Bid/Proposal/Contract Number: _____

Bid/Proposal/Contract Name: _____

A. To be completed by the Bidder/Service Provider

Name of Bidder: _____
Address: _____
_____

Contact Person: _____
Telephone: _____ Fax: _____
Email: _____

B. To be completed by WMBE/SLBE

Name of WMBE/SLBE: _____
Address: _____
_____

Contract Person: _____
Telephone: _____Fax: _____
Email: _____

C. Identify the scope of work to be performed or item(s) to be supplied by the WMBE/SLBE. On unit price bids, identify to which bid line item the WMBE/SLBE's work scope or supply corresponds:

_____
_____
_____

D. Cost of work to be performed by WMBE/SLBE: _____

E. Cost of work to be performed by WMBE/SLBE as a percent of total City contract amount:_____

Bidder/Proposer certifies that it intends to utilize the WMBE/SLBE listed above, and that the work described above is accurate. Bidder/Proposer will provide City with copy of the related subcontract agreement and/or purchase order prior to commencement of the WMBE/SLBE's work. The WMBE/SLBE firm certifies that it has agreed to provide such work/supplies for the amount stated above.

Bidder/Proposer: _____ Date: _____
Signature and Title

WMBE/SLBE Firm: _____ Date: _____
Signature and Title

Official Letter of Intent Instructions
City of Tampa
Equal Business Opportunity Program

The Official Letter of Intent must be submitted to the soliciting department within ten (10) work days of the bid opening, prior to award. Not providing all letters of intent within the prescribed time frame may be cause to delay award or declare the bid to be non-responsive.

Bid/Proposal/Contract Number- Please provide bid/proposal/contract number provided by City of Tampa procuring department.

Bid/Proposal/Contract Name – Please provide bid/proposal/contract name provided by City of Tampa procuring department.

To be Completed by the Bidder/Service Provide – Please provide prime contractor or main bidders detailed company information as indicated.

To be completed by the WMBE/SLBE – Please provide WMBE/SLBE subcontractor detailed company information as indicated.

Bidder is to Identify the scope of work to be performed or item(s) to be supplied by the WMBE/SLBE. On unit price bids indentify, which bid line item the WMBE/SLBE's scope of work or supply corresponds – Please provide details of the services or supplies the WMBE/SLBE will provide.

Cost of work to be performed by WMBE/SLBE – Provide agreed upon estimate of work or supplies total price (Unit prices are accepted if specific quantities have yet to be determined).

Bidder/Proposer – Signature of authorized agent for the prime contractor or main bidder with date signed.

WMBE/SLBE firm – Signature of authorized agent for the WMBE/SLBE subcontractor or supplier with date signed.

Contract Confirmation – A copy of the executed subcontract agreement and/or purchase order with the WMBE/SLBE must be filed with the City of Tampa immediately upon execution and/or prior to commencement of work by WMBE/SLBE.