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US 27 WATER MAIN EXTENSION
WINDSONG OAK DRIVE TO COUNTRY ROAD 48

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SECTION 01000

PROJECT REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Specifications: The Technical Specifications consist of three (3) parts: General, Products, and Execution. The General part of a Specification contains General Requirements which govern the Work. The Products and Execution parts modify and supplement the General Requirements by detailed requirements for the Work and shall always govern whenever there appears to be a conflict.
- B. Scope of Work:
1. The Work to be done consists of the furnishing of all labor, materials, and equipment, and the performance of all Work included in this Contract.
 2. Work Included:
 - a. The Contractor shall furnish all labor, superintendence, materials, plant power, light, heat, fuel, water, tools, appliances, equipment, supplies, and means of construction necessary for proper performance and completion of the Work. The Contractor shall obtain and pay for all necessary local building permits. The Contractor shall perform and complete the Work in the manner best calculated to promote rapid construction consistent with safety of life and property and to the satisfaction of the Engineer, and in strict accordance with the Contract Documents. The Contractor shall clean up the Work and maintain it during and after construction, until accepted, and shall do all Work and pay all costs incidental thereto. He shall repair or restore all structures and property that may be damaged or disturbed during performance of the Work.
 - b. The cost of incidental work described in these Project Requirements, for which there are no specific Contract Items, shall be considered as part of the general cost of doing the Work and shall be included in the prices for the various Contract Items. No additional payment will be made, therefor.
 - c. The Contractor shall provide and maintain such modern plant, tools, and equipment as may be necessary, in the opinion of the Engineer, to perform in a satisfactory and acceptable manner all the Work required by this Contract. Only equipment of established reputation and proven efficiency shall be used. The Contractor shall be solely responsible for the adequacy of his workmanship, materials, and equipment, prior approval of the Engineer notwithstanding.
 3. Public Utility Installations and Structures:
 - a. Public utility installations and structures shall be understood to include all poles, tracks, pipes, wires, conduits, vaults, manholes, and all other appurtenances and facilities pertaining thereto whether owned or controlled by the Owner, other governmental bodies, or privately owned by individuals, firms, or corporations, used to serve the public with transportation, traffic control, gas, electricity, telephone, sewerage, drainage, water, or other public or private property which may be affected by the Work shall be deemed included hereunder.

- b. The Contract Documents contain data relative to existing public utility installations and structures above and below the ground surface. These data are not guaranteed as to their completeness or accuracy, and it is the responsibility of the Contractor to make his own investigations to inform himself fully of the character, condition, and extent of all such installations and structures as may be encountered and as may affect the construction operations.
- c. The Contractor shall protect all public utility installations and structures from damage during the Work. Access across any buried public utility installation or structure shall be made to avoid any damage to these facilities. All required protective devices and construction shall be provided by the Contractor at his expense. All existing public utilities damaged by the Contractor shall be repaired by the Contractor, at his expense. No separate payment shall be made for such protection or repairs to public utility installations or structures.
- d. Public utility installations or structures owned or controlled by the Owner or other governmental body, which are shown on the Drawings to be removed, relocated, replaced, or rebuilt by the Contractor, shall be considered as a part of the general cost of doing the Work and shall be included in the prices bid for the various Contract Items. No separate payment shall be made therefor.
- e. Where public utility installations or structures owned or controlled by the Owner or other governmental body are encountered during the course of the Work, and are not indicated on the Drawings or in the Specifications, and when, in the opinion of the Engineer, removal, relocation, replacement, or rebuilding is necessary to complete the Work under this Contract, such Work shall be accomplished by the utility having jurisdiction, or such Work may be ordered, in writing by the Engineer, for the Contractor to accomplish. If such work is accomplished by the utility having jurisdiction it will be carried out expeditiously, and the Contractor shall give full cooperation to permit the utility to complete the removal, relocation, replacement, or rebuilding as required. If the Contractor accomplishes such work, it will be paid for as extra work as provided in the Agreement.
- f. The Contractor shall, at all times in performance of the Work, employ acceptable methods and exercise reasonable care and skill so as to avoid unnecessary delay, injury, damage, or destruction of public utility installations and structures; and shall, at all times in the performance of the Work, avoid unnecessary interference with, or interruption of, public utility services, and shall cooperate fully with the owners thereof to that end.
- g. The Contractor shall give written notice to Owner and other governmental utility departments and other owners of public utilities of the location of his proposed construction operations, at least 48-hours in advance of breaking ground in any area or on any unit of the Work.
- h. The maintenance, repair, removal, relocation, or rebuilding of public utility installations and structures, when accomplished by the Contractor as herein provided, shall be done by methods approved by the owners of such utilities.

1.02 DRAWINGS AND PROJECT MANUAL

- A. Drawings: When obtaining data and information from the Drawings, figures shall be used in preference to scaled dimensions, and large-scale drawings in preference to small-scale drawings.
- B. Supplementary Drawings:

1. When, in the opinion of the Engineer, it becomes necessary to explain more fully the Work to be done or to illustrate the Work further or to show any changes which may be required, drawings known as Supplementary Drawings, with specifications pertaining thereto, will be prepared by the Engineer, and the Contractor will be furnished one (1) complete set of reproducible black-line bond copies (24 inches by 36 inches) and one (1) reproducible copy of the Project Manual.
2. The Supplementary Drawings shall be binding upon the Contractor with the same force as the Contract Drawings. Where such Supplementary Drawings require either less or more than the estimated quantities of Work, credit to the Owner or compensation therefor to the Contractor shall be subject to the terms of the Agreement.

C. Contractor to Check Drawings and Data:

1. The Contractor shall verify all dimensions, quantities, and details shown on the Drawings, Supplementary Drawings, Schedules, Specifications, or other data received from the Engineer, and shall notify him of all errors, omissions, conflicts, and discrepancies found therein. Failure to discover or correct errors, conflicts, or discrepancies shall not relieve the Contractor of full responsibility for unsatisfactory work, faulty construction, or improper operation resulting therefrom, nor from rectifying such conditions at his own expense. He will not be allowed to take advantage of any errors or omissions, as full instructions will be furnished by the Engineer, should such errors or omissions be discovered.
2. All schedules are given for the convenience of the Engineer and the Contractor and are not guaranteed to be complete. The Contractor shall assume all responsibility of the making of estimates of the size, kind, and quality of materials and equipment included in work to be done under the Contract.

D. Intent:

1. All Work called for in the Specifications applicable to this Contract, but not shown on the Drawings in their present form, or vice versa, shall be of like effect as if shown or mentioned in both. Work not specified in either the Drawings or in the Specifications but involved in carrying out their intent or in the complete and proper execution of the Work, is required and shall be performed by the Contractor as though it were specifically delineated or described.
2. The apparent silence of the Specifications as to any detail, or the apparent omission from them of a detailed description concerning any work to be done and materials to be furnished, shall be regarded as meaning that only the best general practice is to prevail and that only material and workmanship of the best quality is to be used, the interpretation of these Specifications shall be made upon that basis.

1.03 MATERIALS AND EQUIPMENT

A. Manufacturer:

1. All transactions with the manufacturers or subcontractors shall be through the Contractor, unless the Contractor shall request and at the Engineer's option, that the manufacturer or subcontractor deal directly with the Engineer. Any such transactions shall not in any way release the Contractor from his full responsibility under this Contract.
2. Any two (2) or more pieces of material or equipment of the same kind, type, or classification, and being used for identical types of service, shall be made by the same manufacturer.

B. Delivery:

1. The Contractor shall deliver materials in ample quantities to ensure the most speedy and uninterrupted progress of the Work so as to complete the Work within the allotted time.
2. The Contractor shall also coordinate deliveries in order to avoid delay in, or impediment of, the progress of the work of any related Contractor.

C. Tools and Accessories:

1. The Contractor shall, unless otherwise stated in the Contract Documents, furnish with each type, kind, or size of equipment, one (1) complete set of suitably marked high grade special tools and appliances which may be needed to adjust, operate, maintain, or repair the equipment. Such tools and appliances shall be furnished in approved painted steel cases, properly labeled and equipped with good grade cylinder locks and duplicate keys.
2. Spare parts shall be furnished as specified herein and as recommended by the manufacturer necessary for the operation of the equipment, not including materials required for routine maintenance.
3. Each piece of equipment shall be provided with a substantial nameplate, securely fastened in place and clearly inscribed with the manufacturer's name, year of manufacture, serial number, weight, and principal rate data.

D. Service of Manufacturer's Engineer:

1. The Contract Prices for equipment shall include the cost of furnishing a competent and experienced engineer or superintendent who shall represent the manufacturer and shall assist the Contractor, when required, to install, adjust, test, and place in operation, the equipment in conformity with the Contract Documents.
2. After the equipment is placed in permanent operation by the Owner, such engineer or superintendent shall make all adjustments and tests required by the Engineer to prove that such equipment is in proper and satisfactory operating condition and shall instruct such personnel as may be designated by the Owner in the proper operation and maintenance of such equipment.

1.04 INSPECTION AND TESTING

A. General:

1. For tests specified to be made by the Contractor, the testing personnel shall make the necessary inspections and tests, and the reports thereof shall be in such form as will facilitate checking to determine compliance with the Contract Documents. Electronic copies shall be submitted, and authoritative certification thereof must be furnished to the Engineer as a prerequisite for the acceptance of any material or equipment.
2. If, in the making of any test of any material or equipment, it is ascertained by the Engineer that the material or equipment does not comply with the Contract Documents, the Contractor will be notified thereof, and he will be directed to refrain from delivering said material or equipment, or to remove it promptly from the site or from the Work and replace it with acceptable material, without cost to the Owner.
3. Tests of electrical and mechanical equipment and appliances shall be conducted in accordance with the recognized test codes of the ANSI, ASME, or the IEEE, except as may otherwise be stated herein.

4. The Contractor shall be fully responsible for the proper operation of equipment during testing and instruction periods and shall neither have nor make any claim for damage which may occur to equipment prior to the time when the Owner formally takes over the operation thereof.

B. Costs:

1. All inspection and testing of materials furnished under this Contract will be provided by the Contractor, unless otherwise expressly specified.
2. The cost of shop and field tests of equipment and of certain other tests specifically called for in the Contract Documents shall be borne by the Contractor, and such costs shall be deemed to be included in the Contract Price.
3. Materials and equipment submitted by the Contractor, as the equivalent to those specifically named in the Contract, may be tested by the Owner for compliance. The Contractor shall reimburse the Owner for the expenditures incurred in making such tests of materials and equipment which are rejected for non-compliance.

C. Certificate of Manufacture:

1. Contractor shall furnish to Engineer authoritative evidence in the form of a certificate of manufacture that the materials to be used in the Work have been manufactured and tested in conformity with the Contract Documents.
2. These certificates shall be notarized and shall include copies of the results of physical tests and chemical analyses, where necessary, that have been made directly on the product or on similar products of the manufacturer.

D. Shop Test:

1. Each piece of equipment for which pressure, duty, capacity, rating, efficiency, performance, function, or special requirements are specified shall be tested in the shop of the maker in a manner which shall conclusively prove that its characteristics comply fully with the requirements of the Contract Documents.
2. Electronic copies of the manufacturer's actual test data and interpreted results thereof, accompanied by a certificate of authenticity sworn to by a responsible official of the manufacturing company and/or independent laboratory, shall be submitted to the Engineer for approval.
3. The cost of shop tests and of furnishing manufacturer's preliminary and shop test data of operating equipment shall be borne by the Contractor.

E. Start-ups Tests:

1. As soon as conditions permit, the Contractor shall furnish all labor, materials, and instruments and shall make start-up tests of equipment.
2. If the start-up tests disclose any equipment furnished under this Contract which does not comply with the requirements of the Contract Documents, the Contractor shall, prior to demonstration tests, make all changes, adjustments, and replacements required. The furnishing Contractor shall assist in the start-up tests as applicable.

F. Demonstration Tests:

1. Prior to Contractor's request for a Substantial Completion inspection, all equipment and piping installed under this Contract shall be subjected to demonstration tests as specified or required to prove compliance with the Contract Documents.

2. The Contractor shall furnish labor, fuel, energy, water, chemicals, and all other materials, equipment, and instruments necessary for all demonstration tests, at no additional cost to the Owner. Contractor shall assist in the demonstration tests as applicable.

1.05 LINES AND GRADES

A. Grade:

1. All work under this Contract shall be constructed in accordance with the lines and grades shown on the Drawings, or as given by the Engineer. The full responsibility for keeping alignment and grade shall rest upon the Contractor.
2. Adjustments of grades shown on Drawings may be necessary to conform to actual field conditions or to maintain cover under proposed future grades. Such adjustments shall be considered part of the job conditions and no extra compensation will be allowed for such changes, except where specifically noted in the Drawings or Specifications. Such adjustments must be approved by the Engineer prior to being made.
3. The Engineer will establish bench marks and baseline controlling points. Reference marks for lines and grades as the Work progresses will be located by the Contractor to cause as little inconvenience to the prosecution of the Work as possible. The Contractor shall so place excavation and other materials as to cause no inconvenience in the use of the reference marks provided. He shall remove any obstructions placed by him contrary to this provision.

B. Surveys:

1. The Contractor shall furnish and maintain, at his own expense, stakes and other such materials.
2. The Contractor shall check such reference marks by such means as he may deem necessary and, before using them, shall call the Engineer's attention to any inaccuracies.
3. The Contractor shall, at his own expense, establish all working or construction lines and grades as required from the reference marks set by the Engineer, and shall be solely responsible for the accuracy thereof. He shall, however, be subject to the check and review by the Engineer.

C. Safeguarding Marks:

1. The Contractor shall safeguard all points, stakes, grade marks, monuments, and bench marks made or established on the Work, bear the cost of re-establishing them if disturbed, and bear the entire expense of rectifying work improperly installed due to not maintaining or protecting or to removing without authorization such established points, stakes, and marks.
2. The Contractor shall safeguard all existing and known property corners, monuments, and marks adjacent to but not related to the Work and shall bear the cost of re-establishing them if disturbed or destroyed.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01025 MEASURE AND PAYMENT

1.01 GENERAL

- A. The Contractor shall receive and accept the compensation provided in the Proposal and the Contract as full payment for furnishing all materials, labor, tools and equipment, for performing all operations necessary to complete the work under the Contract, and also in full payment for all loss or damages arising from the nature of the work, or from any discrepancy between the actual quantities of work and quantities herein estimated by the Engineer, or from the action of the elements or from any unforeseen difficulties which may be encountered during the prosecution of the work until the final acceptance by the Owner.
- B. The prices stated in the proposal include all costs and expenses for taxes, labor, equipment, materials, commissions, transportation charges and expenses, patent fees and royalties, labor for handling materials during inspection, together with any and all other costs and expenses for performing and completing the work as shown on the Drawings and specified herein. The basis of payment for an item at the unit price shown in the proposal shall be in accordance with the description of that item in this Section.
- C. The Contractor's attention is again called to the fact that the quotations for the various items of work are intended to establish a total price for completing the work in its entirety. Should the Contractor feel that the cost for any item of work has not been established by the Bid Form or Payment Items, he shall include the cost for that work in some other applicable bid item, so that his proposal for the project does reflect his total price for completing the work in its entirety.

1.02 MEASUREMENT

- A. The quantities for payment under this Contract shall be determined by actual measurement of the completed items, in place, ready for service and accepted by the Owner, in accordance with the applicable method of measurement therefor contained herein.

1.03 PAYMENT ITEMS

- A. Items are as enumerated on the bid form. Project is lump sum.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01027

APPLICATIONS FOR PAYMENT

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: Submit Applications for Payment to the Engineer in accordance with schedule established by Conditions of the Contract and Agreement between Owner and Contractor.
- B. Related Requirements Described Elsewhere:
 - 1. Construction Progress Schedules: Section 01310
 - 2. Schedule of Values: Section 01370
 - 3. Construction Photographs: Section 01380
 - 4. Contract Closeout: Section 01700
 - 5. Project Record Documents: Section 01720

1.02 FORMAT REQUIRED

- A. Submit applications for payment on the Application and Certificate for Payment Form which will be provided by the Engineer. The application shall consist of itemized data typed on 8-1/2 inch x 11 inch or 8-1/2 inch x 14 inch white paper continuation sheets.
- B. Provide itemized data on continuation sheets of format, schedules, line items, and values specified on the Application and Certificate for Payment Form. The Contractor shall use the item descriptions and contract values included in schedule of values, approved and accepted by the Engineer as a basis for preparation of the Application for Payment Form.

1.03 PREPARATION OF APPLICATION FOR EACH PROGRESS PAYMENT

- A. Application Form:
 - 1. Fill in required information, including that for Change Orders executed prior to date of submittal of application.
 - 2. Fill in percent complete for each activity and dollar values to agree with respective percentages.
 - 3. Execute certification with signature of a responsible officer of Contractor.
- B. Continuation Sheets:
 - 1. Fill in total list of all scheduled component items of the Work, with item number and scheduled dollar value for each item.
 - 2. Fill in dollar value in each column for each scheduled line item when Work has been performed or products stored. Round off values to nearest dollar, or as specified for Schedule of Values.
 - 3. List each Change Order executed prior to date of submission, at the end of the continuation sheets. List by Change Order Number, and description, as for an original component item of the Work.

4. To receive approval for payment on component material stored on site, submit copies of the original paid invoices or releases of lien with the Application and Certificate for Payment.
5. As provided for in the Application and Certificate for Payment Form, the Contractor shall certify, for each current pay request, that all previous progress payments received from the Owner, under this Contract, have been applied by the Contractor to discharge in full, all obligations of the Contractor in connection with Work covered by prior Applications for Payment, and all materials and equipment incorporated into the Work are free and clear of all liens, claims, security interest, and encumbrances. Contractor shall attach to each Application and Certificate for Payment like affidavits by all Subcontractors.

1.04 SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

- A. Contractor shall submit suitable information, with a cover letter identifying:
 1. Project
 2. Application number and date
 3. Detailed list of enclosures
 4. For stored products
 - a. Item number and identification as shown on application.
 - b. Description of specific material and manifest.
- B. Submit one (1) copy of data and cover letter for each copy of application.
- C. The Contractor is to maintain an updated set of drawings to be used as record drawings in accordance with Section 01720: Project Record Documents. As a prerequisite for monthly progress payments, the Contractor is to exhibit the updated record drawings for review by the Owner and the Engineer.
- D. Each monthly application for payment shall incorporate the corresponding "monthly progress status report" and updated construction schedule, prepared in accordance with the requirements of Section 01310: Construction Progress Schedules.
- E. As a prerequisite for payment, Contractor shall submit a duly executed letter from surety consenting to payment due and progress to date. The Contractor shall also submit partial releases of lien from all subcontractors and suppliers.
- F. Provide construction photographs in accordance with Section 01380: Construction Photographs.

1.05 PREPARATION OF APPLICATION FOR FINAL PAYMENT

- A. Fill in application form as specified for progress payments. Provide information as required by the General Conditions and Section 01700: Contract Closeout.
- B. Furnish evidence of completed operations and insurance in accordance with the General Conditions.

1.06 SUBMITTAL PROCEDURE

- A. Submit Applications for Payment to the Engineer at the time stipulated in the Agreement, or as agreed to at the pre-construction meeting. Review the percentage complete with the Engineer and resolve any conflicts or discrepancies.
- B. Applications for payment, along with required backup documentation, should be submitted to the Engineer and Owner electronically for review and approval.

- C. When the Engineer finds the Application and Certificate for Payment Form is properly completed and correct, he will execute the Certificate for Payment and transmit the forms to the Owner, with a copy to the Contractor.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01050 FIELD ENGINEERING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: Provide and pay for field engineering service for Project.
 - 1. Survey work required in execution of Work.
 - 2. Civil, structural, or other professional engineering services specified or required to execute Contractor's construction methods.
 - 3. The method of field staking for the construction of the Work shall be at the option of the Contractor.
 - 4. The accuracy of any method of staking shall be the responsibility of the Contractor. All engineering for vertical and horizontal control shall be the responsibility of the Contractor.
 - 5. The Contractor shall be held responsible for the preservation of all stakes and marks. If any stakes or marks are carelessly or willfully disturbed by the Contractor, the Contractor shall not proceed with any work until he has established such points, marks, lines, and elevations as may be necessary for the prosecution of the Work.
 - 6. The Contractor shall retain the services of a registered land surveyor licensed in the State of Florida to identify existing control points and maintain a survey during construction.
- B. Related Requirements Described Elsewhere:
 - 1. Conditions of the Contract.
 - 2. Project Record Documents: Section 01720

1.02 QUALIFICATIONS OF SURVEYOR OR ENGINEER

- A. Qualified engineer or registered land surveyor, acceptable to the Owner and the Engineer.
- B. Registered professional engineer of the discipline required for the specific service on the Project, currently licensed in the State of Florida.

1.03 SURVEY REFERENCE POINTS

- A. Locate and protect control points prior to starting site work, and preserve all permanent reference points during construction.
 - 1. Make no changes or relocations without prior written notice to the Engineer.
 - 2. Report to the Engineer when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations
 - 3. Require surveyor to replace Project control points which may be lost or destroyed at no additional

1.04 PROJECT SURVEY REQUIREMENTS

- A. Establish a minimum of two (2) permanent bench marks on site, referenced to data established by survey control points.
 - 1. Record locations, with horizontal and vertical data, on Project Record Documents

B. Establish lines and levels, locate and lay out, by instrumentation and similar appropriate means:

1. Site improvements:

- a. Stakes for grading, fill, and topsoil replacement.
- b. Utility slopes and invert elevations.

2. Batter boards for structure.

3. Building foundation, column locations, and floor levels.

4. Controlling lines and levels required for mechanical and electrical trades.

C. From time to time, verify layouts by same methods.

1.05 RECORDS

A. Maintain a complete, accurate log of all control and survey work as it progresses.

B. At the end of the project, submit a certified site survey at 1 inch equals 30 feet scale on reproducible tracing sheets 24 inches by 36 inches, indicating the building corners and location of all new structures and elevations of stormwater facilities, pavement areas, sidewalks, finished floors, vaults, and above grade piping.

C. At the end of the project, submit a certified survey at the same scale as the Engineer's line drawings indicating elevations and stationing at 100-foot pipe increments and at all valve and fitting location.

1.06 SUBMITTALS

A. Submit name and address of surveyor and professional engineer to the Engineer.

B. On the request of the Engineer, submit documentation to verify accuracy of field engineering work.

C. Submit certificate signed by a registered engineer or surveyor certifying that elevations and locations of improvements are in conformance with the Contract Documents, or if not in conformance, certify as to variances from the Contract Documents.

D. Submit drawings showing locations of all structures constructed. This drawing shall be included with the Project Record Documents.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01065

PERMITS AND FEES

PART 1 - GENERAL

- A. The Contractor shall obtain all permits and licenses related to his work, including but not limited to, the necessary construction permits except as otherwise provided herein. The Contractor shall also, if in effect and applicable at the date of bid opening, pay any governmental agency charges and inspection fees required for the prosecution of the work. If the Contractor desires connection of utility services (telephone or electricity) to a field office, he will be responsible for securing the necessary permits and any connection or disconnection charges involved.
- B. Permits by Owner: The Owner has applied for, or will apply for, permits from the following agencies.
 - 1. Florida Department of Environmental Protection Permit
 - 2. Florida Department of Transportation Right-of-Way Permit
- C. The Contractor shall adhere to all permit requirements as contained in permits obtained by the Owner.
- D. The Contractor shall obtain all permits required for construction that are not listed above.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01070

ABBREVIATIONS AND SYMBOLS

PART 1 - GENERAL

1.01 STANDARDS AND ABBREVIATIONS

A. Referenced Standards: Any reference to published specifications or standards of any organization or association shall comply with the requirements of the specification or standard which is current on the date of Advertisement for Bids. In case of a conflict between the referenced specifications or standards, the one having the more stringent requirements shall govern.

1. In case of conflict between the referenced specifications or standards and the Contract Documents, the Contract Documents shall govern.

B. Abbreviations:

AA	Aluminum Association
AAA	American Arbitration Association
AABC	Associated Air Balance Council
AAMA	Architectural Aluminum Manufacturers Association
AASHO	The American Association of State Highway Officials
ABA	American Bar Association
ABMA	American Boiler Manufacturers Association
ABPA	Acoustical and Board Products Association
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
AEIC	Association of Edison Illuminating Companies
AFBMA	Anti-Friction Bearing Manufacturers Association
AGA	American Gas Association
AGC	Associated General Contractors of America
AGMA	American Gear Manufacturers Association
AHA	American Hardboard Association
AI	The Asphalt Institute
AIA	American Institute of Architects
AIA	American Insurance Association
AIEE	American Institute of Electrical Engineers (Now IEEE)
AIMA	Acoustical and Insulating Materials Association
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Moving and Conditioning Association
ANSI	American National Standard Institute
APA	American Plywood Association
API	American Petroleum Institute
APWA	American Public Works Association
AREA	American Railway Engineering Association
ARI	American Refrigeration Institute
ASA	American Standards Association (Now ANSI)
ASAH	American Society of Architectural Hardware Consultants
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASSCBC	American Standard Safety Code for Building Construction

ASSHTO	American Association of State Highway Transportation Officials
ASTM	American Society for Testing and Materials
AWG	American Wire Gauge
AWI	Architectural Woodwork Institute
AWPA	American Wood Preservers Association
AWPB	American Wood Preservers Bureau
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Institute of America (formerly SCPI)
CDA	Copper Development Association
CFS	Cubic Feet Per Second
CMAA	Crane Manufacturers Association of America
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standard
DHI	Door and Hardware Institute
DIPRA	Ductile Iron Pipe Research Association
DOT Spec	Standard Specification for Road and Bridge Construction Florida Department of Transportation
E/A	Engineer and/or Architect
EDA	Economic Development Association
EEI	Edison Electric Institute
EPA	Environmental Protection Agency
FCI	Fluid Control Institute
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
Fed Spec	Federal Specification
FPS	Feet Per Second
FS	Federal Standards
GPM	Gallons Per Minute
HMI	Hoist Manufacturers Institute
HP	Horsepower
HSBII	Hartford Steam Boiler Inspection and Insurance Co.
ID	Inside Diameter
IEEE	Institute of Electrical and Electronic Engineers
IFI	Industrial Fasteners Institute
IPCEA	Insulated Power Cable Engineers Association
IPS	Iron Pipe Size
MGD	Million Gallons Per Day
MHI	Materials Handling Institute
MMA	Monorail Manufacturers Association
NBFU	National Board of Fire Underwriters
NBHA	National Builders' Hardware Association
NBS	National Bureau of Standards
NCSA	National Crushed Stone Association
NCSPA	National Corrugated Steel Pipe Association
NEC	National Electrical Code
NECA	National Electrical Contractors' Association
NEMA	National Electrical Manufacturers' Association
NFPA	National Fire Protection Association
NLA	National Lime Association
NPC	National Plumbing Code
NPT	National Pipe Threads
NSC	National Safety Council

NSF	National Sanitation Foundation
OD	Outside Diameter
OSHA	U.S. Department of Labor, Occupational Safety and Health Act
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute
PS	United States Products Standards
PSI	Pounds per Square Inch
PSIA	Pounds per Square Inch Absolute
PSIG	Pounds per Square Inch Gauge
RPM	Revolutions Per Minute
SAE	Society of Automotive Engineers
SDI	Steel Decks Institute
SJI	Steel Joists Institute
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SSI	Scaffolding and Shoring Institute
SSPC	Steel Structures Painting Council
SSPC	Structural Steel Painting Council
STA	Station (100 feet)
TDH	Total Dynamic Head
TH	Total Head
UBC	Uniform Building Code
UL	Underwriter's Laboratories, Inc.
USASI	United States of America Standards Institute

C. Additional abbreviations and symbols are shown on the Drawings.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01100

SPECIAL PROJECT PROCEDURES

PART 1 - GENERAL

1.01 PIPE LOCATIONS

- A. All pipes shall be located substantially as indicated on the Drawings, but the Engineer reserves the right to make such modifications in locations as may be found desirable to avoid interference with existing structures or for other reasons. Where fittings are noted on the Drawings, such notation is for the Contractor's convenience and does not relieve him from laying and jointing different or additional items where required.

1.02 OPEN EXCAVATIONS

- A. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons, and damage to property. The Contractor shall, at his own expense, provide suitable and safe bridges and other crossings for accommodating travel by workmen.

1.03 TEST PITS

- A. Test pits for the purpose of locating underground pipeline or structures in advance of the construction shall be excavated and backfilled by the Contractor. Test pits shall be backfilled immediately after their purpose has been satisfied and maintained in a manner satisfactory to the Engineer. The costs for such test pits shall be borne by the Contractor.

1.04 JURISDICTIONAL DISPUTES

- A. It shall be the responsibility of the Contractor to pay all costs that may be required to perform any of the Work shown on the Drawings or specified herein in order to avoid any work stoppages due to jurisdictional disputes.

1.05 INCLEMENT WEATHER

- A. In the event of inclement weather, the Contractor shall, and shall cause subcontractors to carefully protect the Work and materials against damage or injury from the weather. If, in the opinion of the Engineer, any portion of work or materials have been damaged or injured by reason of failure on the part of the Contractor or any subcontractors to so protect the Work, such Work and materials shall be removed and replaced at the expense of the Contractor.

1.06 COORDINATION OF WORK

- A. The Contractor shall cooperate fully so as to eliminate or minimize the creation of conflicts. Adjustments from time to time may be required in the Contractor's work location and/or schedule, provided a reasonable notice is given by the Owner or Engineer.

1.07 USE OF PUBLIC STREETS

- A. The use of public streets and roads shall be such as to provide minimum inconvenience to the public and to other traffic. Any earth or other excavated materials spilled from trucks shall be removed by the Contractor and the streets and roads cleaned to the satisfaction of the Owner.

1.08 TRAFFIC

- A. All safety precautions shall be taken, and all traffic controls be furnished satisfactorily to the City, County, Florida Department of Transportation, and/or other government agencies having jurisdiction, where partial or complete obstruction of highways, roadways, streets, drives or sidewalks is required in the performance of the Work.

1.09 CHEMICALS

- A. All chemicals used during project construction, or furnished for project operations, whether herbicide, pesticide, disinfectant, polymer, reactant or of other classification, must show approval of the State Department of Health, Florida Department of Environmental Protection and if required, also the EPA or USDA. Use of all such chemicals and disposal of residues shall be in strict conformance with the manufacturer's instructions or recommended use procedures.

1.10 SAFETY AND HEALTH REGULATIONS

- A. The Contractor shall comply with the Department of Labor Safety & Health Regulations for construction promulgated under the Occupational Safety & Health Act of 1970, (PL 91-596) and under Section 107 of the Contract Work Hours & Safety Standards Act (PL 91-54).
- B. All equipment furnished and installed under this Contract shall comply to Part 1910, Occupational Safety & Health Standards & Amendments thereto.
- C. The Contractor shall comply with the Florida Trench Safety Act (90-96, Florida Law).
- D. All materials, equipment, and components that come in contact with drinking water or drinking water chemicals shall be in conformance with ANSI/NSF Standard 61.

1.11 STATE AND FEDERAL PERMITS

- A. Construction in Florida Department of Transportation rights-of-way, wetlands and navigable water bodies will be governed by applicable State and Federal permits. All conditions set forth on the permits shall be a part of the Contract and they shall be attached by addendum.

1.12 INSPECTION

- A. The authorized representatives and agents of the USEPA and FDEP shall be permitted to inspect all work, material, payrolls, personnel records, invoices of materials and any other relevant data and records. The Owner and Engineer shall be permitted access to any work area for the inspection of work and materials. The Owner may, at the Contractor's expense, order the uncovering or removal of any finished work if circumstances indicate faulty work or materials were used in the original installation. The Owner and Engineer shall also be permitted to inspect material invoices, payrolls or any other relevant data or records as may be necessary or required to satisfy the requirements of the Contract.

1.13 ENVIRONMENTAL PROTECTION

- A. General:
 - 1. Contractor shall comply with all Federal, State and Local laws and regulations controlling pollution of the environment. Contractor shall take necessary precautions to prevent pollution of streams, lakes, ponds, and reservoirs with fuels, oils, bitumens, chemicals, or other harmful materials and to prevent pollution of the atmosphere from particulate and gaseous matter. In the event of conflict between such laws and regulations and the requirements of the Specifications, the more restrictive requirements shall apply. Environmental protection requirements specified in other Sections shall be considered as supplementing the requirements of this Section.

2. Failure of the Contractor to fulfill any of the requirements of this Section may result in the Owner ordering the stopping of construction operations.
3. Failure on the part of the Contractor to perform the necessary measures to control erosion, siltation, and pollution will result in the Owner notifying the Contractor to take such measures. In the event the Contractor fails to perform such measures within 24 hours after receipt of such notice, the Owner may stop the Work as provided above, or may proceed to have such measures performed by others. The cost of such work performed by others plus related fees by the Engineer will be deducted from monies due to the Contractor on his Contract.
4. All erosion and pollution control features installed by the Contractor shall be acceptably maintained by the Contractor during the time that construction work is being done.
5. Repair or replace damaged or inoperative erosion and pollution control devices as directed by the Engineer or the Owner's Representative.
6. Where there is a high potential for erosion and possible water pollution, the Contractor shall not expose, by his construction methods or procedures, an area of erosive land at any one time larger than the minimum amount required for the proper and efficient construction operation. If the exposure of any incomplete work corresponding to the exposure period required for erosion is anticipated, temporary protective measures shall be taken to prevent the erosion or collapse of land in the immediate construction area.

B. Erosion and Pollution Control Schedule:

1. At or prior to the preconstruction conference, the Contractor shall submit to the Owner for his information, an electronic copy of his erosion and pollution control work schedule. This schedule shall show the time relationship between phases of the Work which must be coordinated to reduce erosion and pollution and shall describe construction practices and temporary control measures which will be used to minimize erosion and pollution.
2. The schedule shall also show the Contractor's proposed method of erosion control on haul roads and borrow and material pits, and his plan for disposal of waste materials or other sources of pollution.
3. Maps or other documents may also be required to show the proposed final surface gradient of proposed borrow pits, soil type base course pits, and waste areas.
4. No work shall be started until the erosion and pollution control schedules and methods of operations have been submitted to the Owner for his information.

C. Air Pollution Controls:

1. Contractor shall control dust caused by his operations in the construction of the Project, including but not specifically limited to the following:
 - a. Clearing, grubbing, and stripping.
 - b. Excavation and placement of embankment.
 - c. Cement and aggregate handling.
 - d. Limerock stabilization.
 - e. Use of haul roads.
 - f. Sandblasting or grinding.

2. Contractor shall control air pollution from the following causes in constructing the project:
 - a. Volatiles escaping from asphalt and cutback materials.
 - b. Use of herbicides or fertilizers.
3. Control of dust and other air pollutants by the Contractor shall include:
 - a. Exposing the minimum area of land.
 - b. Applying temporary mulch with or without seeding.
 - c. Use of water sprinkler trucks.
 - d. Use of covered haul trucks.
 - e. Use of stabilizing agents in solution.
 - f. Use of dust palliatives and penetration asphalt on temporary roads.
 - g. Use of wood chips in traffic and work areas.
 - h. Use of vacuum-equipped sandblasting systems.
 - i. Use of plastic sheet coverings.
 - j. Restricting the application rate of herbicides to recommended dosage.
 - k. Materials shall be covered and protected from the elements.
 - l. Application equipment and empty containers shall not be rinsed and discharged so as to pollute a stream, river, lake, pond, water impoundment, or the ground water.
 - m. Relay of operations until climate or wind conditions dissipate or inhibit the potential pollutants.

D. Open Burning of Combustible Wastes:

1. No open burning of combustible waste materials or vegetation shall be permitted. All waste materials shall be removed from the site or within public rights-of-way and disposed in a legal manner.

E. Permanent and Temporary Water Pollution Control (Soil Erosion):

1. Sufficient precautions shall be taken during construction to minimize the run-off of polluting substances such as silt, clay, fuels, oils, bitumens, calcium chloride, or other polluting materials harmful to humans, fish, or other life, into the supplies and surface waters of the State. Control measures must be adequate to assure that turbidity in the receiving water will not be increased more than allowed by the State or controlling agency. Such measures may consist of construction of berms, dikes, dams, drains and sediment basins, or use of fiber mats, woven plastic filter cloths, gravel, mulches, quick growing grasses, sod, bituminous spray and other erosion control devices or methods approved by the State or controlling agency.
2. The Contractor shall not be permitted frequent fording of live streams with construction equipment; therefor, temporary bridges or other structures shall be used wherever such crossings adversely affect sediment levels and an appreciable number of stream crossings are necessary.
3. The Contractor shall promptly clear all waterways and drainage patterns of false work, piling, debris, or other obstructions placed during construction work and not a part of the finished work.

4. The Contractor shall remove and dispose of silt accumulations as directed by the Engineer or the Owner's Representative.
5. If new and additional erosion control structures are to be installed, under this project, to prevent possible future erosion as a result of work under this contract, they shall be constructed concurrently with the other work, as early as possible, and as conditions permit.

F. Noise Control:

1. The Contractor shall provide adequate protection against objectionable noise levels caused by the operation of construction equipment in order to comply with all current City ordinances and these Specifications. Sound levels shall be measured at the exterior of the nearest exterior wall of the nearest residence or building. Levels at construction equipment shall not exceed 85 dBA at any time. Sound levels in excess of allowable values are sufficient cause to have the work halted until equipment can be quieted to these levels. Work stoppage by the Engineer or Owner for excessive noise shall not relieve the Contractor of the other portions of this Specification including, but not limited to, completion dates and bid amounts.

1.14 TREE AND SHRUB PROTECTION AND TRIMMING

- A. Contractor shall exercise care to protect all trees and shrubs designated to remain. Trees and shrubs outside construction limits shall remain and shall be protected and where damaged, restored to original condition. Contractor shall obtain approval from the Owner prior to removing any trees. Trees damaged within construction limits due to negligence shall be restored to original condition.
- B. Tree limbs which interfere with construction operations and are approved for pruning shall be neatly cut with sharp pruning instruments; do not break or chop. All cut faces shall be coated with an approved tree pruning compound which is waterproof, antiseptic, elastic and free of kerosene, coal tar, creosote and other substances harmful to plants. Pruning operations shall be extended to restore the natural shape of the entire tree or shrub. Do not allow fires under or adjacent to trees or other plants which are to remain.
- C. Contractor shall protect tree and shrub root systems. Do not store construction materials, debris or excavated materials beyond construction limits. Do not permit vehicles or construction equipment beyond the limits of utility line construction. Restrict foot traffic to prevent excessive compaction of soil over root system. Excavated material shall be stockpiled away from tree drip lines as approved by the Engineer. Protect tree and shrub root systems from damage due to noxious materials in solution caused by run-off or spillage during construction operations, or drainage from stored materials. Protect root systems from flooding, erosion or excessive wetting resulting from dewatering operations. Excavate within the drip line of trees only when approved by the Engineer. Where trees are designated to remain within the limits of construction and trenching for utilities is required within tree drip lines, cut roots with sharp pruning instruments; do not break or chop. Paint roots over 2" caliper with approved tree pruning compound.
- D. Trees damaged by construction operations shall be repaired promptly after damage occurs to prevent progressive deterioration of damaged trees. Removed trees, branches, roots, and other excess materials shall be removed from the construction site to an approved landfill at the expense of the Contractor.

1.15 SITE CLEANUP AND RESTORATION

- A. The Contractor shall keep the working area free at all times of tools, materials and equipment not essential to the progress of the Work. Debris, waste materials, and rubbish shall be properly disposed of and not allowed to accumulate. If the Contractor should fail to do this, the Owner will make the necessary arrangements to affect the cleanup by others and will back charge the cost to the Contractor. If such action becomes necessary on the part of and in the opinion of the Owner, the Owner will not be responsible for the inadvertent removal of material which the Contractor would not have disposed of had he affected the required cleanup.

- B. Where material or debris has washed or flowed into or been placed in watercourses, ditches, gutters, drains, catch basins, or elsewhere as result of the Contractor's operations, such material or debris shall be entirely removed and satisfactorily disposed of during progress of the Work, and the ditches, channels, drains etc., kept in a clean and neat condition.
- C. On or before the completion of the Work, the Contractor shall, unless otherwise directed or permitted in writing, tear down and remove all temporary buildings and structures built by him; shall remove all temporary works, tools, and machinery or other construction equipment furnished by him; shall remove, acceptably disinfect, and cover all organic matter and material containing organic matter in, under, and around privies, houses, and other buildings used by him; shall remove all rubbish from any grounds he has occupied; and shall leave the roads and all parts of the premises and adjacent property affected by his operations, in a neat and satisfactory condition.
- D. The Contractor shall restore the entire project site to its original or better condition, with the exception of any area(s) designated for alteration by the Contract Documents. The Contractor shall restore or replace, when and as directed, any public or private property damaged by his work, equipment, or employees to a condition at least equal to that existing immediately prior to the beginning of operations. To this end the Contractor shall do, as required, all necessary highway or driveway, walk, and landscaping work. Suitable materials, equipment, and methods shall be used for such restoration.
- E. The Contractor shall thoroughly clean all materials and equipment installed by him and his subcontractors and, on completion of the Work, shall deliver it undamaged and in fresh and new appearing condition.

1.16 LAWS AND REGULATIONS

- A. It shall be the responsibility of the Contractor to give all notices and comply with all the laws, rules, regulations, ordinances, etc., that may be applicable at the time the Work is started on the project. Should the Contractor discover the Drawings or Specifications are contradictory to, or in variance with the above, he shall notify the Engineer immediately, in writing, in order that any required changes or modifications can be made. It is not the Contractor's responsibility to make certain that the Drawings or Specifications are in non-compliance with any of the above; however, should he be aware of any existing discrepancy, or have reason to believe such may exist and performs work without proper notice to the Engineer, the Contractor shall be responsible for any cost involved in making the necessary alterations or corrections.

1.17 CONTRACTOR'S USE OF PREMISES

- A. All project construction work will be accomplished on the Owner's property, public rights-of-way or within temporary construction easements and the Contractor shall confine his activity to those designated areas. The Contractor shall not enter upon private property for any reason without securing prior permission from the property owner. Such permission, including any stipulations, shall be in writing and a copy shall be delivered to the Engineer prior to the Contractor's entry or occupation of the subject property. This requirement will be rigidly enforced, particularly with regard to the utilization of vacant areas adjacent to the work site for the storage of materials or parking equipment.
- B. The Contractor shall perform his work in such manner that he will not damage adjacent public or private property. Any damage to existing physical structures or utility services shall be repaired or restored promptly at no expense to the Owner.
- C. The Contractor shall avoid damage to and preserve all existing vegetation (grass, shrubs, trees, etc.) on or near the work area which do not, within reason, interfere with construction. The Contractor will be responsible for and required to replace or restore all such vegetation damaged or destroyed at no cost to the Owner. The Contractor will also be responsible for any unauthorized cutting or damage to trees, shrubs, etc., and also damage caused by careless operation of equipment, storage of materials and rutting or tracking of grass by equipment.

- D. The Contractor shall conduct access, hauling, filling, and storage operations as specified herein and as shown on the Contract Drawings:
 - 1. On-site borrow areas are designated as follows: Suitable material, as approved by Engineer, from excavations for project structures. Any additional borrow material required shall be provided by the Contractor from off-site.
 - 2. On-site spoil areas will become property of the Contractor and are to be disposed off-site.
- E. Construct all fill areas so runoff will not flood improved areas.
- F. All connections to existing piping systems shall be made as shown or indicated on the Drawings after consultation, cooperation, and coordination with the Owner. Some such connections may have to be made during off-peak hours (late night or early morning hours). The Contractor shall give a minimum of 72 hours notice to the Owner when tie-ins with the existing plant utilities are required.
- G. For major utility pipeline tie-ins and relocations, the Contractor shall submit a detailed Plan of Action for review and approval by the Owner and the Engineer. No major utility relocation or tie-ins shall proceed until the Plan of Action for that Work is approved.

1.18 HAZARDOUS LOCATIONS

- A. The Contractor shall be responsible for identification of hazardous locations, appropriate construction methods, and all other safety issues.

1.19 ADDITIONAL PROVISIONS

- A. The Contractor shall provide, at his own cost, all necessary temporary facilities for access to, and for protection of, all existing structures. The Contractor is responsible for all damage to existing structures, equipment, and facilities caused by his construction operations, and must repair all such damage when and as ordered by the Engineer.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01200

PROJECT MEETINGS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. The Contractor shall cooperate and coordinate with the Engineer to schedule and administer the preconstruction meeting, monthly progress meetings, and specifically called meetings throughout the progress of the Work.
2. The Contractor shall:
 - a. Prepare agenda for meetings.
 - b. Make physical arrangements for meetings.
3. Representatives of Contractor, subcontractors, and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.
4. The Owner will attend meetings to ascertain that the Work is expedited consistent with Contract Documents and construction schedules.
5. The Contractor shall record the preconstruction meeting and each progress meeting in its entirety, and shall provide the Engineer with an electronic copy of such recording, having good quality and clarity, and a typed transcript of the minutes of the meeting.

B. Related Requirements Described Elsewhere:

1. Construction Progress Schedules: Section 01310.
2. Shop Drawings, Working Drawings, and Samples: Section 01340.
3. Project Record Documents: Section 01720.

1.02 PRECONSTRUCTION MEETING

- A. Engineer will schedule a preconstruction meeting no later than twenty (20) days after date of Notice to Proceed. The meeting shall be scheduled at the convenience of all parties.
- B. Location: A local site, convenient for all parties, designated by the Engineer.
- C. Attendance:
 1. Owner's representative.
 2. Engineer and his professional consultants.
 3. Resident project representative.
 4. Contractor and his superintendent.
 5. Major subcontractors.
 6. Representatives of major suppliers and manufacturers, as appropriate.
 7. Governmental and Utilities representatives, as appropriate.

8. Others as requested by the Contractor, Owner, and Engineer.

D. The Engineer shall preside at the preconstruction meeting. Contractor shall provide for keeping minutes and distribution of minutes. The purpose of the preconstruction meeting is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established.

E. The suggested agenda for the preconstruction meeting will include but not be limited to the following:

1. Distribution and discussion of:
 - a. List of major subcontractors and suppliers.
 - b. Projected schedules.
 - c. Schedule of Values.
2. Critical work sequencing: Relationships and coordination with other contracts and/or work and continuing water treatment plant operation.
3. Major equipment deliveries and priorities.
4. Project coordination: Designation and responsible personnel.
5. Procedures and processing of:
 - a. Field decisions.
 - b. Proposal requests.
 - c. Request for Information.
 - d. Submittals.
 - e. Change Orders.
 - f. Applications for Payment.
6. Submittal of Shop Drawings, projects data and samples.
7. Adequacy of distribution of Contract Documents.
8. Procedures for maintaining Record Drawings.
9. Use of premises:
 - a. Office, work, and storage areas.
 - b. Owner's requirements.
 - c. Access and traffic control.
10. Construction facilities, controls, and construction aids.
11. Temporary utilities.
12. Safety and first aid procedures.
13. Check of required Bond and Insurance certifications.
14. Completion time for contract and liquidated damages.
15. Request for extension of Contract Time.

16. Procedures for periodic monthly (or whatever interval is deemed appropriate or necessary, however, a minimum of monthly meetings will be required) progress meetings, for all involved.
17. Security procedures.
18. Procedures for making partial payments.
19. Guarantees on completed work.
20. Equipment to be used.
21. Project layout and staking of work.
22. Project inspection.
23. Labor requirements.
24. Laboratory testing of material requirements.
25. Provisions for material stored on site and monthly inventory of materials stored.
26. Requirements of other organizations such as utilities, railroads, highway departments, building departments.
27. Rights-of-way and easements.
28. Housekeeping procedures.
29. Posting of signs and installation of Project Sign.
30. Pay request submittal dates.
31. Equal opportunity requirements.

1.03 PROGRESS MEETINGS

- A. The Engineer shall schedule regular periodic meetings. The progress meetings will be held a minimum of once every thirty (30) days and at other times as required by the progress of the Work. The first meeting shall be held within thirty (30) days after the preconstruction meeting or thirty (30) days or less after the date of Notice to Proceed.
- B. Hold called meetings as required by progress of the Work.
- C. Location of the meetings: As designated by the Owner.
- D. Attendance:
 1. Engineer and his professional Subconsultants as needed.
 2. Resident Project Representative.
 3. Contractor and his Superintendent.
 4. Owner's representatives.
 5. Subcontractors (active on the site, as appropriate to the agenda).
 6. Others as appropriate to the agenda (suppliers, manufacturers, other subcontractors, etc.)
- E. The Engineer shall preside at the meetings. Contractor shall provide for keeping minutes and distribution of the minutes. The purpose of the meetings will be to review the progress of the Work.

F. The suggested agenda for the progress meetings will include but not be limited to the following:

1. Review approval of minutes of previous meeting.
2. Review of Work progress since previous meeting and Work scheduled (3-week look ahead schedule).
3. Field observations, problems, conflicts.
4. Problems which impede construction schedule.
5. Review of off-site fabrication, delivery schedules.
6. Corrective measures and procedures to regain projected schedule.
7. Status of Construction Schedule and revisions to the Construction Schedule as appropriate.
8. Progress schedule during succeeding work period.
9. Coordination of schedules.
10. Review status of submittals and submittal schedule, expedite as required.
11. Maintenance of quality standards.
12. Pending changes and substitutions.
13. Shop drawing problems.
14. Review proposed changes for:
 - a. Effect on Construction Schedule and on completion date.
 - b. Effect on other contracts of the Project.
15. Critical/long lead items.
16. Other business.

G. The Contractor is to attend progress meetings and is to study previous meeting minutes and current agenda items, and be prepared to discuss pertinent topics and provide specific information including but not limited to:

1. Status of all submittals and what specifically is being done to expedite them.
2. Status of all activities behind schedule and what specifically will be done to regain the schedule.
3. Status of all material deliveries, latest contact with equipment manufacturers, and specific actions taken to expedite materials.
4. Status of open deficiencies and what is being done to correct them.

H. The Contractor is to provide a current submittal log at each progress meeting in accordance with Sections 01340: Shop Drawings, Working Drawings and Samples.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01310

PROJECT SCHEDULES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. Prepare and submit to the Engineer in accordance with these Specifications, the estimated construction progress schedules demonstrating complete fulfillment of all contract requirements.
2. Submit revised progress schedules on a monthly basis. No partial payments shall be approved until there is an approved construction progress schedule.

1.02 FORM OF SCHEDULES

A. Prepare schedule in the form of a horizontal bar chart.

1. Provide separate horizontal bar for each trade or operation within each structure or item.
2. Horizontal time scale:
 - a. Show starting and completion dates for each activity in terms of the number of days after Notice to Proceed. All completion dates shown shall be within the period specified for contract completion. The first Schedule developed for approval shall be for the full length of the contract time. Subsequent schedules developed during construction can be modified based upon actual product deliveries and schedule of work.
 - b. Identify the first work day of each month.
3. Scale and Spacing: To allow space for notations and future revisions.
4. Maximum Sheet Size: 24 inches by 36 inches.

B. Format of Listings: The chronological order of each item of work for each structure.

C. Identification of Listings: By major specification on section numbers as applicable and structure.

1.03 CONTENT OF SCHEDULES

A. Construction Progress Schedule:/

1. Show the complete sequence of construction by activity.
2. Show the dates for the beginning of, and completion of, each major element of construction in no more than a one (1) week increment scale.
3. Show projected percentage of completion for each item, as of the first day of each month.
4. Show projected dollar cash flow requirements for each month of construction and for each activity as indicated by the approved Schedule of Values.

B. Submittal schedule for Shop Drawings and Samples shall be in accordance with Section 01340: Shop Drawings, Working Drawings, and Samples. Indicate on the Schedule the following:

1. The dates for Contractor's submittals.

2. The dates submittals will be required for Owner-furnished products, if applicable.

C. A typed list of all long lead items (equipment, materials, etc.)

D. To the extent that the progress schedule or any revised progress schedule shows anything not jointly agreed upon or fails to show anything jointly agree upon, it shall not be deemed to have been approved by the Engineer. Failure to include any element of work required for the performance of this Contract shall not excuse the Contractor from completing all work required within any applicable completion date, notwithstanding the Engineer's approval of the progress schedule.

1.04 PROGRESS REVISIONS

A. Indicate progress of each activity to date of submission.

B. Show changes occurring since previous submission of schedule.

1. Major changes in scope.
2. Activities modified since previous submission.
3. Revised projections of progress and completion.
4. Other identifiable changes.

C. Provide a narrative report as needed to define:

1. Problem areas, anticipated delays, and the impact on the schedule.
2. Corrective action recommended, and its effect.
3. The effect of changes on schedule of other prime contractors.

1.05 SUBMITTALS

A. Submittal Requirements:

1. Logic network and/or time phased bar chart.
2. Narrative description of the logic and reasoning of the schedule.

B. Time of Submittals.

1. Within fifteen (15) working days after Notice to Proceed, Contractor shall submit a network diagram describing the activities to be accomplished in the project and their dependency relationships, (predecessor/successor) as well as a tabulated schedule as herein defined. The schedule produced and submitted shall indicate a project completion date on or before the contract completion date.
2. Within ten (10) working days after the conclusion of the Engineer's review period, Contractor shall revise the network diagram as required and resubmit the network diagram and a tabulated schedule produced therefrom. The revised network diagram and tabulated schedule shall be reviewed and accepted or rejected by the Engineer within fifteen (15) working days after receipt. The network diagram and tabulated schedule, when accepted by the Engineer, shall constitute the project work schedule unless a revised schedule is required due to substantial changes in the work scope, a change in contract time or a recovery schedule is required and requested.

C. Acceptance:

1. The finalized schedule will be acceptable to the Engineer when, in the opinion of the Engineer, it demonstrates an orderly progression of the Work to completion in accordance with the contract requirements. Such acceptance will neither impose on the Engineer's responsibility for the progress or scheduling of the Work nor relieve Contractor from full responsibility therefor. The finalized schedule of shop drawing submittals will be acceptable to the Engineer when, in the opinion of the Engineer, it demonstrates a workable arrangement for processing the submittals in accordance with the requirements. The finalized Schedule of Values will be acceptable to the Engineer as to form and content when, in the opinion of the Engineer, it demonstrates a substantial basis for equitably distributing the contract sum. When the network diagram and tabulated schedule have been accepted, The Contractor shall submit to the Engineer an electronic copy of the time-scaled network diagram.

D. Revised Work Schedules:

1. Contractor, if requested by the Engineer, shall provide a revised work schedule if, at any time, the Engineer considers the completion date to be in jeopardy because of "activities behind schedule." The revised work schedule shall include a new diagram and tabulated schedule conforming to the requirements of this section, designed to show how the Contractor intends to accomplish the work to meet the completion date. The form and method employed by Contractor shall be the same as for the original work schedule. No payment will be made if activities fall more than two (2) weeks behind schedule and a revised work schedule is not furnished.

E. Schedule Revisions:

1. The Engineer may require Contractor to modify any portions of the work schedule that becomes infeasible because of "activities behind schedule" or for any other valid reason. An activity that cannot be completed by its original latest completion date shall be deemed to be behind schedule. No change may be made to the sequence, duration or relationships of any activity without approval of the Engineer.

1.06 DISTRIBUTION

A. Distribute copies of the reviewed schedules to:

1. Engineer.
2. Subcontractors.
3. Other concerned parties.
4. Owner

B. Instruct recipients to report promptly to the Contractor, in writing, any problems anticipated by the projections shown in the schedule.

1.07 CHANGE ORDERS

- A. Upon approval of a change order, the approved changes shall be reflected in the next scheduled revision or update submittal by the Contractor.

1.08 SCHEDULE MONITORING

- A. At no less than monthly intervals, or when specifically requested by Engineer, Contractor shall submit to the Engineer of an updated schedule for those activities that remain to be completed.
- B. The updated schedule shall be submitted in the form, sequence, and number of copies requested for the initial schedule.

1.09 PROGRESS MEETINGS

- A. For the bi-weekly progress meeting, Contractor shall submit a three (3) week look-ahead schedule showing all activities in progress, uncompleted or scheduled to be worked during the three weeks. The three (3) weeks include the current week plus the next two (2) weeks. All activities shall be from the approved schedule and must be as shown on the schedule, unless behind or ahead of schedule.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01340

SHOP DRAWINGS, WORKING DRAWINGS, AND SAMPLES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. The Contractor shall submit to the Engineer for review and approval, such Shop Drawings, Test Reports, and Product Data on materials and equipment (hereinafter in this Section called Data), and material samples (hereinafter in this Section called Samples) as are required for the proper control of work, including but not limited to those Shop Drawings, Data, and Samples for materials and equipment specified elsewhere in the Specifications and in the Drawings.
2. Within fourteen (14) calendar days after the Effective Date of the Agreement, the Contractor shall submit to the Engineer a complete list of preliminary data on items for which Shop Drawings are to be submitted. Included in this list shall be the names of all proposed manufacturers furnishing specified items. Review of this list by the Engineer shall in no way, expressed or implied, relieve the Contractor from submitting complete Shop Drawings and providing materials, equipment, etc., fully in accordance with the Contract Documents. This procedure is required in order to expedite final review of Shop Drawings.
3. The Contractor is to maintain an accurate updated submittal log and will bring this log to each scheduled progress meeting with the Owner and the Engineer. This log should include the following items:
 - a. Submittal description and number assigned.
 - b. Date to Engineer.
 - c. Date returned to Contractor (from Engineer).
 - d. Status of submittal (Approved, Approved as Noted, Amend and Resubmit, and Rejected).
 - e. Date of resubmittal and return (as applicable).
 - f. Date material release (for fabrication).
 - g. Projected date of fabrication.
 - h. Projected date of delivery to site.
 - i. Status of O&M manuals submittal.
 - j. Specification Section.
 - k. Drawing sheet number.

B. Related Requirements Described Elsewhere.

1. Construction Progress Schedules: Section 01310.
2. Project Record Documents: Section 01720.
3. Operating and Maintenance Data: Section 01730.

C. Terminology:

1. When used in the Contract Documents, the term "Shop Drawing" shall be considered to mean Contractor's plans for materials and equipment which become an integral part of the Project.
2. When used in the Contract Documents, the term "Working Drawings" shall be considered to mean the Contractor's plan for temporary structures such as temporary bulkheads, support of open cut excavation, support of utilities, ground water control systems, forming and falsework for underpinning, and for such other work as may be required for construction but does not become an integral part of the Project.

1.02 CONTRACTOR'S RESPONSIBILITY

- A. It is the responsibility of the Contractor to check all drawings, data and samples prepared before submitting them to the Engineer for review. Each and every copy of the Drawings and data shall bear the Contractor's stamp showing that they have been so checked. Shop drawings submitted to the Engineer without the Contractor's stamp will be returned to the Contractor for conformance with this requirement. Shop drawings shall indicate any deviations in the submittal from requirements of the Contract Documents. If the Contractor takes exception to the specifications, the Contractor shall note the exception in the letter of transmittal to the Engineer.
- B. Determine and verify:
1. Field measurements.
 2. Field construction criteria.
 3. Catalog numbers and similar data.
 4. Conformance with Specifications.
- C. The Contractor shall furnish the Engineer a schedule of Shop Drawing submittals fixing the respective dates for the submission of shop and working drawings, the beginning and ending of manufacture, testing, and installation of materials, supplies, and equipment. This schedule shall indicate those that are critical to the progress schedule.
- D. The Contractor shall not begin any of the work covered by a Shop Drawing, Data, or a Sample returned for correction until a revision or correction thereof has been reviewed and returned, by the Engineer, with approval.
- E. The Contractor shall submit to the Engineer all shop drawings and schedules sufficiently in advance of construction requirements to provide no less than thirty (30) calendar days for checking and appropriate action from the time the Engineer receives them.
- F. All submittals shall be accompanied with a transmittal letter prepared in duplicate containing the following information:
1. Date.
 2. Project Title and Number.
 3. Contractor's name and address.
 4. The number of each Shop Drawings, Project Data, and Sample submitted.
 5. Notification of Deviation from Contract Documents.

- a. The Contractor shall indicate in **bold type** at the top of the cover sheet of submittal of shop drawing if there is a deviation from the Drawings, Specifications, or referenced specifications or codes.
- b. The Contractor shall also list any deviations from the Drawings, Specifications, or referenced specifications or codes and identify prominently on the applicable Shop Drawings.

6. Submittal Log Number conforming to Specification Section Number.

- G. The Contractor shall submit an electronic copy of descriptive or product data information and Shop Drawings to the Engineer plus the number of copies which the Contractor requires returned.
- H. The Contractor shall be responsible for and bear all costs of damages which may result from the ordering of any material or from proceeding with any part of Work prior to the completion of the review by the Engineer of the necessary Shop Drawings.
- I. The Contractor shall be fully responsible for observing the need for and making any changes in the arrangement of piping, connections, wiring, manner of installation, etc., which may be required by the materials/equipment he proposes to supply both as pertains to his own work and any work affected under other parts, headings, or divisions of the Drawings and Specifications.
- J. The Contractor shall not use Shop Drawings as a means of proposing alternate items to demonstrate compliance with the Drawings and Specifications.
- K. Each submittal will bear a stamp indicating the Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal. The Contractor stamp shall be similar to the sample given below.

(OWNER'S NAME) (PROJECT NAME) (PROJECT NUMBER)	
SHOP DRAWING NO.: _____ SPECIFICATION SECTION: _____ DRAWING NO.: _____	
WITH RESPECT TO THIS SHOP DRAWING OR SAMPLE, I HAVE DETERMINE AND VERIFIED ALL QUANTITIES, DIMENSIONS, SPECIFIED PERFORMANCE CRITERIA, INSTALLATION REQUIREMENTS, MATERIALS, CATALOG NUMBER, AND SIMILAR DATA WITH RESPECT THERETO AND REVIEWED OR COORDINATED THIS SHOP DRAWING OR SAMPLE WITH OTHER SHOP DRAWINGS AND SAMPLES AND WITH HE REQUIREMENTS OF THE WORK AND THE CONTRACT DOCUMENTS.	
_____ NO VARIATION FROM CONTRACT DOCUMENTS _____ VARIATION FROM CONTRACT DOCUMENTS AS SHOWN.	
(CONTRACTOR'S NAME) (CONTRACTOR'S ADDRESS)	
BY: _____ DATE: _____ AUTHORIZED SIGNATURE: _____	

NOTE: NOT TO SCALE

- L. Drawings and schedules shall be checked and coordinated with the work of all trades and sub-contractors involved, before they are submitted for review by the Engineer and shall bear the Contractor's stamp of approval as evidence of such checking and coordination. Drawings or schedules submitted without this stamp of approval shall be returned to the Contractor for resubmission.

1.03 ENGINEER'S REVIEW OF SHOP DRAWINGS

- A. The Engineer's review of Shop Drawings, Data, and Samples as submitted by the Contractor will be to determine if the item(s) generally conform to the information in the Contract Documents and is compatible with the design concept. The Engineer's review and exceptions, if any, will not constitute an approval of dimensions, connections, quantities, and details of the material, equipment, device, or item shown.
- B. The review of drawings and schedules will be general, and shall not be construed:
 - 1. As permitting any departure from the Contract Documents.
 - 2. As relieving the Contractor of responsibility for any errors, including details, dimensions, and materials.
 - 3. As approving departures from details furnished by the Engineer, except as otherwise provided herein.
- C. If the drawings or schedules, as submitted, describe variations and show a departure from the Contract Documents, which the Engineer finds to be in the interest of the Owner and to be so minor as not to involve a change in Contract Price or contract time, the Engineer may return the reviewed drawings without noting an exception.
- D. "Approved As Noted" - Contractor shall incorporate Engineer's comments into the submittal before release to manufacturer. The Contractor shall send a letter to the Engineer acknowledging the comments and their incorporation into the Shop Drawing.
- E. "Amend And Resubmit" - Contractor shall resubmit the Shop Drawing to the Engineer. The resubmittal shall incorporate the Engineer's comments highlighted on the Shop Drawing.
- F. "Rejected" - Contractor shall correct, revise and resubmit Shop Drawing for review by Engineer.
- G. Resubmittals will be handled in the same manner as first submittals. On resubmittals the Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, to revisions other than the corrections requested by the Engineer on previous submissions. The Contractor shall make any corrections required by the Engineer.
- H. If the Contractor considers any correction indicated on the drawings to constitute a change to the Drawings or Specifications, the Contractor shall give written notice thereof to the Engineer.
- I. If the Contractor considers any correction indicated on the drawings to constitute a change to the Drawings or Specifications, the Contractor shall give written notice thereof to the Engineer.
- J. All drawings, schematics, manufacturer's product data, certifications, and other Shop Drawing submittals required by a system specification shall be submitted at one time as a package to facilitate interface checking.
- K. No partial submittals will be reviewed. Submittals not deemed complete will be stamped "Rejected" and returned to the Contractor for resubmittal. Unless otherwise specifically permitted by the Engineer, make all submittals in groups containing all associated items for:
 - 1. Systems.
 - 2. Processes.
 - 3. As indicated in specific Specifications Sections.
- L. Only the Engineer shall utilize the color "red" in marking Shop Drawing submittals.

- M. Shop drawing and submittal data shall be reviewed by the Engineer for each original submittal and first resubmittal; thereafter review time for subsequent resubmittals shall be charged to the Contractor and the Contractor shall reimburse the Owner for services rendered by the Engineer as specified in the Supplementary Conditions.

1.04 SHOP DRAWINGS

- A. Shop Drawings shall be complete and detailed and shall consist of fabrication, erection, setting and schedule drawings, manufacturer's scale drawings, and wiring and control diagrams. Catalogs cuts, catalogs, pamphlets, descriptive literature, and performance and test data shall be considered only as supportive information to required Shop Drawings as defined above. As used herein, the term "manufactured" applies to standard units usually mass-produced; and "fabricated" means items specifically assembled or made out of selected materials to meet individual design requirements.
- B. Manufacturer's catalog sheets, brochures, diagrams, illustrations, and other standard descriptive data shall be clearly marked to identify pertinent materials, products, or models. Delete information which is not applicable to the Work by striking or cross-hatching.
- C. Each Shop Drawing shall be submitted with an 8-1/2" by 11" cover sheet which shall include a title block for the submittal. Each Shop Drawing cover sheet shall have a blank area 3-1/2 inches high by 4-1/2 inches wide, located adjacent to the title block. The title block/cover sheet shall display the following:
1. Project Title and Number.
 2. Name of project building or structure.
 3. Number and title of the Shop Drawing.
 4. Date of Shop Drawing or revision.
 5. Name of Contractor and subcontractor submitting drawing.
 6. Supplier/manufacturer.
 7. Separate detailer when pertinent.
 8. Specification title and Section number.
 9. Applicable Drawing number.
- D. Data on materials and equipment shall include, without limitation, materials and equipment lists, catalog data sheets, catalog cuts, performance curves, diagrams, verification of conformance with applicable standards or codes, materials of construction, and similar descriptive material. Materials and equipment lists shall give, for each item thereon, the name and location of the supplier or manufacturer, trade name, catalog reference, size, finish, and all other pertinent Data.
- E. For all mechanical and electrical equipment furnished, the Contractor shall provide a list including the equipment name, and address, and telephone number of the manufacturer's representative and service company so that service and/or spare parts can be readily obtained.
- F. If drawings show variations from Contract requirements because of standard shop practice or for other reasons, the Contractor shall describe such variations in his letter of transmittal. If acceptable, proper adjustment in the Contract shall be implemented where appropriate. If the Contractor fails to describe such variations, he shall not be relieved of the responsibility for executing the Work in accordance with the Contract, even though such drawings have been reviewed.
- G. All manufacturers or equipment suppliers who propose to furnish equipment or products shall submit an installation list to the Engineer along with the required shop drawings. The installation list shall include

at least five (5) installations where identical equipment has been installed and has been in operation for a period of at least two (2) years unless specified otherwise in the Specification Section applicable.

1.05 WORKING DRAWINGS

- A. Copies of working drawings shall be submitted to the Engineer where required by the Contract Documents or requested by the Engineer and shall be submitted at least thirty (30) calendar days (unless otherwise specified by the Engineer) in advance of their being required for the Work.
- B. Working Drawings shall be signed by a registered Professional Engineer, currently licensed to practice in the State of Florida, and shall convey, or be accompanied by, calculations or other sufficient information to completely explain the structure, machine, or system described and its intended manner of use. Prior to commencing such work, working drawings must have been reviewed without specific exceptions by the Engineer. The review will be for general conformance and will not relieve the Contractor in any way from his responsibility with regard to the fulfillment of the terms of the Contract. All risks to new or existing work are assumed by the Contractor; the Owner and Engineer shall have no responsibility therefor.

1.06 SAMPLES

- A. The Contractor shall furnish, for the approval of the Engineer, samples required by the Contract Documents or requested by the Engineer. Samples shall be delivered to the Engineer as specified or directed. The Contractor shall prepay all shipping charges on samples. Materials or equipment for which samples are required shall not be used in the Work until approved by the Engineer.
- B. Samples shall be of sufficient size and quantity to clearly illustrate:
 - 1. Functional characteristics of the product, with integrally related parts and attachment devices.
 - 2. Full range of color, texture, and pattern.
 - 3. A minimum of three (3) samples of each item shall be submitted.
- C. Each sample shall have a label indicating: (Samples of finished materials shall have additional marking that will identify them under the finished schedules.)
 - 1. Name of Project.
 - 2. Name of Contractor and subcontractor.
 - 3. Material or equipment represented.
 - 4. Place of origin.
 - 5. Name of producer/supplier and brand (if any).
 - 6. Location in Project.
 - 7. Submittal and specification numbers.
- D. The Contractor shall prepare a transmittal letter and a description sheet for each shipment of samples. The description sheet shall contain the information required in Paragraphs 1.06B and C above. He shall enclose a copy of the letter and description sheet with the shipment and send a copy of the letter and description sheet to the Engineer. Approval of a sample shall be only for the characteristics or use named in such approval and shall not be construed to change or modify any Contract requirements.
- E. Approved samples not destroyed in testing shall be sent to the Engineer or stored at the site of the Work. Approved Samples of the hardware in good condition will be marked for identification and may be used in the Work. Materials and equipment incorporated in the Work shall match the approved Samples.

Samples which failed testing or were not approved will be returned to the Contractor at his expense, if so requested at time of submission.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01370 SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. Submit to the Engineer a Schedule of Values allocated to the various lump sum portions of the Work, at the Pre-Construction Conference, and as otherwise specified or requested to be submitted earlier as evidence of the Apparent Low Bidder's qualifications.
2. Upon request of the Engineer, support the values with data which will substantiate their correctness. The data shall include, but not be limited to, quantity of materials, all sub-elements of the activity, and their units of measure.
3. The Schedule of Values shall establish the actual value for each activity of the Work to be completed taken from the Construction Schedule and shall be used as the basis for the Contractor's Applications for Payment.

B. Related Requirements Described Elsewhere:

1. Conditions of the Construction Contract.

1.02 FORM AND CONTENT OF SCHEDULE OF VALUES

A. Type schedule on 8-1/2 inch x 11 inch white paper. Contractor's standard forms and computer printouts may be considered for approval by the Engineer upon Contractor's request. Identify schedule with:

1. Title of project and location.
2. Owner and purchase order number.
3. Engineer and project number.
4. Name and address of Contractor.
5. Contract designation.
6. Date of submission.

B. Schedule shall list the installed value of the component parts of the Work in sufficient detail to serve as a basis for computing item prices for progress payments during construction.

C. Identify each line item with the number and the title of the respective section of the Specifications.

D. For each major item of the Work, list sub-values of major products or operations under the major item.

E. For the various portions of the Work:

1. The amount for each item shall reflect a total installed cost, including a directly proportional amount of the Contractor's overhead and profit.
2. For items on which progress payments will be requested for stored materials, break down the value into:

- a. Cost of the materials delivered and unloaded, with taxes paid. Paid invoices are required for materials. Payment for materials shall be limited to the invoiced amount only.
- b. Total installed value.

F. Round off figures to nearest dollar amount.

G. The sum of the costs of all items listed in the schedule shall equal the total Contract Price.

H. For each item which has an installed value of more than \$25,000, provide a breakdown of costs to list major products or operations under each item.

1.03 SUB SCHEDULE OF UNIT MATERIAL VALUES

A. Submit a separate schedule of unit prices for materials to be stored on site and for those materials incorporated into the Work for which progress payments will be requested.

B. The unit values for the materials shall be broken down into:

- 1. Cost of the material, delivered and unloaded at the site, with taxes paid.
- 2. Copies of paid invoices for component material shall be included with the payment request in which the material first appears.

C. Only materials unique to the project may be billed when stored on site. Materials of standard use such as conduit, wire, small-diameter pipe, steel, etc., shall not be accepted for payment

D. The installed unit value multiplied by the quantity listed shall equal the cost of that item in the Schedule of Values.

1.04 REVIEW AND RESUBMITTAL

A. After review by Engineer, revise and resubmit Schedule of Values and Schedule of Unit Material Values are required.

B. Resubmit revised schedules in same manner.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01380

CONSTRUCTION PHOTOGRAPHY & VIDEOS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Contractor shall be responsible for the production of pre-construction, construction progress and post-construction photographs as provided herein. Owner's Representative may also designate additional subjects for photographs in addition to the general guidelines identified below.

PART 2 – QUALITY

2.01 DESCRIPTION

- A. All photographs must be produced by a competent photographer and shall be digital (10 Mega-Pixel minimum) date-stamped, color photography of commercial quality. All Contractor generated photographs must be stored in a .jpeg file format. Each electronic copy shall be digital date-stamped photographs on a flash drive or other format acceptable to the City.

- 1. The electronic copy shall include:

- a. Name of city and city project number of Contract
 - b. Name of the Contractor
 - c. Description and location of view
 - d. Identity of the photographer

- B. Each photograph submittal must include a Photo Log the includes:

- 1. Name of city and city project number of the contract
 - 2. Name of the Contractor
 - 3. Name of the photographer and company
 - 4. Photograph number
 - 5. Date of the photograph
 - 6. Filename the camera assigns to the photo (e.g. MVC-001.jpg)
 - 7. Appropriate descriptive information to properly identify the location of view to assist in maintaining a concise project record (e.g. location of MH 5 – Line A or Sta: 2+00 – Line A or location of Sedimentation Basin 5, valve, etc.).
 - a. This may be entered as a project drawing or sketch.

PART 3 – VIEWS AND QUANTITIES

3.01 PRE-CONSTRUCTION VIDEO

- A. Pre-Construction Videos are required for projects involving Streets, Right-of-Way, Water, Wastewater, or Stormwater.

- B. Contractor shall document, by video, within the limits of construction, all pre-existing site conditions/elements as listed for the Pre-Construction Photographs in the following section. The video documentation shall provide a clear and continuous view of the project alignment showing all visible utilities and features within the limits of construction. The Pre-Construction Video shall be in a format acceptable to the City and shall be shot prior to the occurrence of any site disturbance but after the Notice to Proceed. An electronic copy shall be submitted within ten (10) calendar days or the Notice to Proceed.

3.02 PRE-CONSTRUCTION PHOTOGRAPHS

- A. Pre-Construction Photographs are required for projects involving Streets, Right-of-Way, Water, Wastewater, or Stormwater.
- B. All pre-construction photographs must be submitted within ten (10) calendar days of the Notice to Proceed. Pre-construction photographs must be taken at sufficient intervals to be able to carefully document the pre-construction conditions of the Work, but in no case less than 100-foot intervals along the street, right-of-way, drainage easement or water/wastewater line route before commencement of Work. Each photograph location shall be taken from a minimum of two (2) views (one forward station view and one backward station view along the street, drainage, easement, or pipeline route) within the limits of construction. Particular attention must be devoted to pre-existing damage to structures; landscape features, streets, curbs, sidewalks, driveways, signs, mailboxes, retaining walls, MSE walls, etc. shall be documented. An identifier such as houses or businesses address/ signs, property numbers, mailboxes, landscaping, etc. shall be included in each view for ease of later identification. At a minimum, Pre-construction photographs must be taken of the following views:
1. The entire street ROW
 2. The entire easement width and length (both permanent and temporary)
 3. All curb lines (both sides of the street) – all pre-existing curb damage not called for replacement within the Work and shall include major cracks
 4. All driveways, steps, and curbs and curb ramps (both side of street)
 5. Fence and gate conditions
 6. Trees, ornamental shrubs, plantings/planter boxes and evidence of irrigation features
 7. Other privately or publicly owned features of facilities that might be disturbed by the construction
 8. Prominent utility features, such as:
 - a. Guy wires, poles, signs, valves, fire hydrants, meters, pull boxes, etc.
 9. Streams and stream banks within the limits of construction
 10. Other significant or prominent features in order to protect the Owner and Contractor following construction (e.g. close up photographs of pre-existing broken curbs, cracked/failed pavement, damaged adjacent retaining walls, etc.)
 11. Views of structures, both inside and adjacent to the ROW/easement in areas where Contractor will be working within five (5) feet of said structure.
 12. Other views as requested by the Owner

3.03 CONSTRUCTION PROGRESS PHOTOGRAPHS

- A. Construction Progress photos must be taken weekly, at least, showing the progress of the work for the week. Construction photographs of the same views taken during pre-construction photography must be taken during the progress of the Work and shall be submitted monthly with Contractor's monthly payment application.

3.04 POST-CONSTRUCTION PHOTOGRAPHS

- A. Post-construction photographs must be taken of the same views as the pre-construction photography to fully document the completed project. Post-construction photographs must be taken after cleanup and site restoration and must be submitted with the final payment.

END OF SECTION

SECTION 01410

TESTING AND TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. The Contractor shall employ and pay for services of an independent testing laboratory to perform soils and concrete testing. The testing laboratory will be selected by the Engineer and shall complete various testing activities as directed by the Engineer; however, the Contractor shall pay for the testing services.
2. Contractor shall cooperate with the laboratory to facilitate the execution of its required services.

B. Related Requirements Described Elsewhere:

1. Conditions of the Contract.
2. Respective section of the Specifications: Certification of Products.
3. Each Specification section listed: Laboratory tests requires, and standards for testing.
4. Testing laboratory inspection, sampling and testing is required for, but not limited to, the following:
 - a. Excavating, Backfilling, and Compaction.
 - b. Stabilized Sub-Base.
 - c. Limerock Base.
 - d. Asphaltic Concrete Pavement
 - e. Cast-in-Place Concrete.

C. The following schedule defines the responsibilities of various tests:

Test	Notes	Paid for/By
Soil Compaction	Pipe Work: every 100 ft. at each lift of compaction minimum. Beneath Structures: each 500 SF each lift of compaction minimum.	Contractor
Settlement Monitoring	As required by testing laboratory	Contractor
Pressure	As specified in Division 15	Contractor
Bacteriological	As required by local and state agencies	Contractor
LBR	Each 600 SF of pavement minimum.	Contractor
Asphaltic Concrete Pavement	Per FDOT Specifications	Contractor
Concrete	Slump test each delivery and compression test five cylinders every 50 C.Y. minimum.	Contractor

- D. Additional Tests: The Contractor shall pay for first tests as specified herein. In the event the first test samples do not meet the applicable material specifications, the Contractor shall take measures to

conform the material and equipment to the Specifications. All subsequent tests after the first test required to show compliance with the Specifications shall be paid for by the Contractor. The costs for retesting shall not be deducted from the allowance.

1.02 CONTRACTOR'S RESPONSIBILITIES

- A. Cooperate with Owner's personnel and laboratory personnel. Provide access to Work and manufacturer's operations.
- B. Provide to the laboratory the preliminary design mix proposed to be used for concrete, and other materials mixes which require control by the testing laboratory.
- C. Materials and equipment used in the performance of work under this Contract are subject to inspection and testing at the point of manufacturer or fabrication. Standard specifications for quality and workmanship are indicated in the Contract Documents. The Engineer may require the Contractor to provide statements or certificates from the manufacturers and fabricators that the materials and equipment provided by them are manufactured or fabricated in full accordance with the standard specifications for quality and workmanship indicated in the Contract Documents. All costs of providing statements and certificates shall be a subsidiary obligation of the Contractor, and no extra charge to the Owner shall be allowed on account of such testing and certification.
- D. Furnish incidental labor and facilities:
 - 1. To provide access to Work to be tested.
 - 2. To facilitate inspections and tests.
- E. Notify Owner a minimum of three (3) working days in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01500 TEMPORARY FACILITIES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: Provide temporary facilities required which shall include, but are not limited to, the following:
 - 1. By Contractor:
 - a. Telephone
 - b. Storage sheds
 - c. Temporary water service
 - d. Temporary sanitary facilities
 - e. Temporary electrical service
 - f. Contractor's field office
 - g. Engineer's field office
 - 2. By Owner:
 - a. None

1.02 TEMPORARY WATER

- A. Furnish and install temporary water service for use throughout construction period.
 - 1. Water for construction purposes
 - 2. Water for other purposes:
 - a. Testing
 - b. Temporary sanitary facilities
 - c. Cleaning
 - d. Potable water source (separate)
- B. Maintain adequate volume of water for all purposes
- C. Water Source:
 - 1. Supplier: City of Leesburg
 - 2. Potable water used shall be separately metered and protected with approved back flow prevention devices. Potable water used will be billed to the Contractor at current utility rates.
- D. Maintain strict supervision of use of temporary services.
 - 1. Enforce conformance with applicable codes and standards
 - 2. Enforce sanitary practices

3. Prevent waste of water
4. Prevent abuse of services

E. Costs of Installation and Operation:

1. Pay costs for water used by all trades, including costs of installation, maintenance, and removal of pipes, meters, and equipment.

F. Requirements of Regulatory Agencies:

1. Pay for permits, fees and deposits required by governing authorities.
2. Comply with Federal, State, and local codes.

1.03 TEMPORARY ELECTRICITY

A. Furnish and install temporary electric power service for construction needs throughout construction period.

1. Power centers for miscellaneous tools and equipment used in construction work.
2. Power for construction equipment.
3. Power for testing and checking equipment.
4. Power for welding units and for other equipment having special power requirements.
5. Power for Contractors, Subcontractors and Owner/Engineer's field offices.

B. Capacity:

1. Adequate electrical service for construction use by all trades during construction period.
2. Notify power company if unusually heavy loads such as welding, and other special power requirements, will be connected.
 - a. Provide special circuits for heavy load requirements.
 - b. Do not overload any circuit.

C. Maintain strict supervision of use of temporary services:

1. Enforce conformance with applicable standards.
2. Enforce safe practices.
3. Prevent abuse of services.

D. Costs of Installation and Operation:

1. Pay costs for temporary electrical power used, including costs of installation, meter, maintenance, and removal of temporary services from point of connection

E. Requirements of Regulatory Agencies:

1. Obtain and pay for permits as required by governing authorities
2. Comply with applicable codes
 - a. National Electrical Code

- b. National Electrical Safety Code
- c. National Fire Protection Association
- d. Federal, State, and local codes and utility company regulations.

1.04 TEMPORARY SANITARY FACILITIES

- A. Furnish and install temporary sanitary facilities for use throughout construction period.
- B. Maintain strict supervision of use of facilities:
 - 1. Enforce conformance with applicable standards.
 - 2. Maintain, service, and clean facilities.
 - 3. Enforce proper use of sanitary facilities.
- C. Cost of Installation and Operation:
 - 1. Pay costs for temporary sanitary facilities, including costs of installation, maintenance, and removal.
 - 2. Costs of Water: as specified in Paragraph 1.02 C.2.
 - 3. Pay service charges for use of portable sanitary units.
- D. Facility Locations:
 - 1. Within the project site.
 - 2. Drinking Water: Convenient to work stations.
 - 3. Toilet and washing facilities.
 - a. Secluded from public observation.
 - b. Convenient for use of personnel in relation to work stations.
 - 4. Obtain acceptance of Engineer and Owner.
- E. Requirements of Regulatory Agencies:
 - 1. Obtain and pay for permits as required by governing authorities.
 - 2. Comply with Federal, State, and local codes.

PART 2 – PRODUCTS

2.01 TEMPORARY SANITARY FACILITIES

- A. General:
 - 1. Material may be new or used but must be adequate for the purpose required.
 - 2. At Contractor's option, patented specialty products may be used, in compliance with applicable codes.

2.02 CONTRACTOR'S FIELD OFFICE AND FACILITIES

- A. Provide either a separate building or a trailer of adequate floor space for Contractor's use.

- B. The trailer shall be weather-tight, have a tight, level floor at least 8 inches off the ground, and shall be insulated, have suitable screened ventilation, and a solid door.
- C. The Contractor shall locate all temporary construction offices and storage trailers where approved by the Owner and the Engineer.

PART 3 – EXECUTION

3.01 GENERAL

- A. Install work in a neat and orderly manner.
- B. Make structurally sound throughout.
- C. Maintain to provide continuous service.
- D. Modify and extend service as work progress requires.

3.02 TEMPORARY WATER

- A. Locate piping and outlets.
 - 1. Provide service convenient to work stations.
 - 2. Avoid interference with:
 - a. Traffic and work areas.
 - b. Materials handling equipment.
 - c. Storage areas.
- B. Do not run piping on floor or on ground.
- C. When necessary to maintain pressure, provide temporary pumps, tanks, and compressors.

3.03 TEMPORARY ELECTRICITY

- A. Service and distribution may be overhead or underground.
- B. Locate to avoid interference with:
 - 1. Traffic and work areas.
 - 2. Cranes
 - 3. Material handling equipment.
 - 4. Storage areas.
- C. Do not run branch circuits on floor or on ground.
- D. Wire all safety devices specified for final operation of equipment.

3.04 TEMPORARY SANITARY FACILITIES

- A. Portable Toilets:
 - 1. Erect securely, and anchor to prevent dislocation or tripping over.

2. Service as often as necessary to prevent accumulation of wastes, and creation of unsanitary conditions.

B. Washing Facilities:

1. Provide faucets, drains and other washing facilities suitable for the type of work requiring washing.

3.05 REMOVAL

- A. Completely remove temporary materials and equipment upon completion of construction.
- B. Clean, and repair damage caused by installation and restore to specified, or original condition.

END OF SECTION

SECTION 01505

MOBILIZATION

PART 1 - GENERAL

1.01 DESCRIPTION AND SCOPE

- A. Mobilization shall include the obtaining of all permits, insurance, and bonds; moving onto the site of all plant and equipment; furnishing and erecting plants, temporary buildings, and other construction facilities; all as required for the proper performance and completion of the Work.
- B. Mobilization shall include, but not be limited to, the following principal items:
 - 1. Move onto the site all Contractor's materials and equipment required for first month operations.
 - 2. Provide a temporary field office for the Contractor's use.
 - 3. Provide a temporary field office for the Engineer's use.
 - 4. Install temporary construction power, wiring, and lighting facilities.
 - 5. Establish fire protection plan and safety program.
 - 6. Secure construction water supply.
 - 7. Provide on-site sanitary facilities and potable water facilities as required by agencies having jurisdiction.
 - 8. Arrange for and erect Contractor's work and storage yard and employee's parking facilities.
 - 9. Submit all required insurance certificates and bonds.
 - 10. Obtain all required permits.
 - 11. Post all OSHA, EPA, Department of Labor, and all other required notices.
 - 12. Submit a detailed construction schedule acceptable to the Engineer, as specified.
 - 13. Submit a schedule of values of the Work.
 - 14. Submit a schedule of submittals.

1.02 DEMOBILIZATION

- A. Demobilization is the timely and proper removal of all Contractor owned material, equipment or plant, from the job site and the proper restoration or completion of work necessary to bring the site into full compliance with the Contract Documents.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01568

TEMPORARY EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. The Work specified in this Section consists of designing, providing, maintaining and removing temporary erosion and sedimentation controls as required by applicable rules and regulations and permit conditions.
2. Temporary erosion controls include, but are not limited to, grassing, mulching, netting, and providing interceptor ditches at ends of berms and at those locations which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits.
3. Temporary sedimentation controls include, but are not limited to, silt dams, traps, barriers, and appurtenances at the foot of sloped surfaces which will ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits.
4. Contractor is responsible for providing effective temporary erosion and sediment control measures during construction or until final controls become effective.

B. Related Work Described Elsewhere:

1. Excavation, Backfilling, and Grading: Section 02220
2. Loaming, Seeding and Mulching: Section 02922
3. Solid Sodding: Section 02822

PART 2 – PRODUCTS

2.01 EROSION CONTROL

- A. Sodding is specified in Section 02822
- B. Netting shall be fabricated of material acceptable to the Owner.

2.02 SEDIMENTATION CONTROL

- A. Bales shall be clean, seed free cereal hay type.
- B. Netting shall be fabricated of material acceptable to the Owner.
- C. Filter stone shall be crushed stone which conforms to Florida Department of Transportation (FDOT) Specifications.
- D. Concrete block shall be hollow, non-load bearing type.
- E. Concrete shall be exterior grade not less than 1 inch thick.

PART 3 – EXECUTION

3.01 EROSION CONTROL

A. Minimum procedures for grassing are:

1. Scarify slopes to a depth of not less than 6 inches and remove large clods, rock, stumps, roots larger than ½ inch in diameter and debris.
2. Sow seed within 24 hours after the ground is scarified with either mechanical seed drills or rotary hand seeders.
3. Apply mulch loosely and to a thickness of between ¾ inch and 1 ½ inches.
4. Apply netting over mulched areas on sloped surfaces.
5. Roll and water seeded areas in a manner which will encourage sprouting of seeds and growing of grass. Reseed areas which exhibit unsatisfactory growth. Backfill and seed eroded areas.

3.02 SEDIMENTATION CONTROL

- #### A.
- Install and maintain silt dams, traps, barriers, and appurtenances as shown on the approved descriptions and working drawings. Hay bales, which deteriorate, and filter stone, which dislodge, shall be replaced.

3.03 PERFORMANCE

- #### A.
- Should any of the temporary erosion and sediment control measures employed by the Contractor fail to produce results which comply with the requirements of the State of Florida, the Owner or Engineer, the Contractor shall immediately take whatever steps are necessary to correct the deficiency at his own expense.

END OF SECTION

SECTION 01650

START-UP AND DEMONSTRATION

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: Demonstrate to Owner and Engineer the Work functions as a complete and operable system under normal and emergency operating conditions.
- B. Contractor shall provide all materials, personnel, equipment, and expendables as needed and as specified to perform the required start-up and demonstration tests.
- C. The intent of the start-up demonstration and testing is for the Contractor to demonstrate to the Owner and the Engineer that the Work will function as a complete and operable system under normal, as well as emergency operating conditions, and is ready for final acceptance.
- D. Related Work Described Elsewhere:
 - 1. Progress Schedules: Section 01310
 - 2. Operating and Maintenance Data: Section 01730
 - 3. Mechanical: Division 15

PART 2 – PRODUCTS

2.01 START-UP PLAN

- A. Submit for approval by the Engineer a detailed start-up plan outlining the schedule and sequence of all tests and start-up activities, including submittal of checkout forms, submittal of demonstration test procedures, start-up, demonstration and testing, submittal of certification of completed demonstration and training. Start-up and commissioning may not begin until the plan is approved by the Engineer.

PART 3 – EXECUTION

3.01 COMPONENT TEST AND CHECK-OUT

- A. Start-up Certification: Prior to system start-up, successfully complete all the testing required of the individual components of the Work. Submit an electronic copy of Check Out Memo for each individual component or piece of equipment, signed by the Contractor or the subcontractor and the manufacturer's representative. All copies of the Operation and Maintenance Manuals must be provided before start-up may begin. These forms shall be completed and submitted before Instruction in Operation to Owner or a request for initiating any final inspections. Insert one (1) copy of this form into the applicable section of each Operation and Maintenance Manual.
- B. Demonstrate to the Engineer and the Owner's representative, that all temporary jumpers and/or bypasses have been removed and all of the components are operating under their own controls as designated.
- C. Coordinate start-up activities with the Owner's operating personnel at the treatment plant site and with the Engineer prior to commencing system start-up.

3.02 START-UP

- A. Confirm all equipment is properly energized, the valves are set to their normal operating condition and the flow path through the new Work is unobstructed.
- B. Slowly fill each hydrostatic structure in the process flow stream with water.
- C. Initiate start-up and training in accordance with, and with the use of, the plant operation and maintenance manuals.
- D. Observe the component operation and make adjustments as necessary to optimize the performance of the Work.
- E. Coordinate with Owner for any adjustments desired or operational problems requiring debugging.
- F. Make adjustments as necessary.

3.03 START-UP DEMONSTRATION AND TESTING

- A. Prior to beginning the start-up demonstration testing, the Contractor shall submit a detailed schedule of operational circumstances for approval by the Engineer. The schedule of operational circumstances shall describe, in detail, the proposed test procedures for each piece of equipment. Provide similar test procedure forms for each piece of equipment or section of the Work to include all particular aspects and features of that equipment or section of the Work and as specified in the Technical Sections of the Specifications. After all Work components have been constructed, field tested, and started up in accordance with the individual Specifications and manufacturer requirements, and after all Check-Out Forms have been completed and submitted, perform the Start-Up Demonstration and Testing. The demonstration period shall be held upon completion of all systems at a starting date to be agreed upon in writing by the Owner or his representative.
- B. The Start-Up Demonstration Testing will be conducted for ten (10) consecutive days. The Work must operate successfully during the ten (10) day testing period in the manner intended. If the Work does not operate successfully, or if the start-up is interrupted due to other contracts, the problems will be corrected and the test will start over from day one. The party causing the interruption will be subject to the assessment of actual damages due to delay.
- C. During the start-up demonstration period, operate the Work, instruct designated plant operating personnel in the function and operation of the Work, and cause various operational circumstances to occur. As a minimum, these circumstances will include average and peak daily flows, random equipment or process failures, tank overflows, surcharges, interlocks, and bypasses. Demonstrate the essential features of the equipment and its relationship to other equipment. The approved schedule of operational circumstances and Demonstration Test Procedures Forms will be used as the agenda during the Start-Up Demonstration Testing period for all equipment and sections of the Work. Coordination of the demonstration test schedule will be accomplished through the Engineer.
- D. Acceptability of the Work's performance will be based on the Work performing as specified under these actual and simulated operating conditions, to provide water treatment facilities functioning as intended and as defined in the Contract Documents.
- E. Demonstrate the essential features of all the mechanical systems as they apply to the Work. Each system shall be demonstrated once only, after completion of testing.
- F. Demonstrate the essential features of all electrical and instrumentation systems including, but not limited to, the following as they apply to the work:

1. Electrical system controls and equipment:

- a. Electrical power equipment
- b. Motor control centers
- c. Motor control devices
- d. Relays
- e. Special transformers
- f. Starting devices

2. Security system

3. Lighting system

4. Panelboards:

- a. Distribution panels
- b. Lighting panels
- c. Main panels
- d. Power panels
- e. Switchboard

5. Wiring devices:

- a. Face plates
- b. Low-voltage controls
- c. Outlets: convenience, special purpose
- d. Switches: regular, time

G. Upon successful completion of the Start-up, Demonstration and Testing, the Owner's personnel will receive the specified training for each system. Training of the Owner's personnel will not be considered valid unless it takes place using a system that has successfully passed the Start-up, Demonstration and Testing.

H. Upon completion of all specified operator training, the Contractor shall submit to the Engineer an electronic copy of the Certificate of Completed Demonstration Form, for each item of equipment or system in the Work, signed by the Contractor, Subcontractor, Engineer, and the Owner. Insert one (1) copy of this form in the applicable section of each Operation and Maintenance Manual.

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: Comply with requirements stated in Conditions of the Contract and in Specifications for administrative procedures in closing out the Work.
- B. Related Requirements Described Elsewhere:
 - 1. Cleaning: Section 01710
 - 2. Project Record Documents: Section 01720
 - 3. Operating and Maintenance Data: Section 01730
 - 4. Warranties and Bonds: Section 01740

1.02 SUBSTANTIAL COMPLETION

- A. The Work will not be substantially complete, and Contractor may not request substantial completion inspection unless the following submittals and work is completed:
 - 1. All Operation and Maintenance manuals have been submitted and approved to the requirements of Section 01730.
 - 2. All equipment has been checked-out by the equipment manufacturer and Certificates of Manufacturer's Check-Out have been submitted as required by Section 01650.
 - 3. Project Record Documents are complete and have been submitted and reviewed to the requirements of Section 01720.
 - 4. All training of Owner's personnel completed.
 - 5. All areas to be used and occupied are safe, operable in automatic and complete.
 - 6. All building occupancy certificates have been issued by the appropriate building permitting agency.
 - 7. All painting, finishes, fencing, cleanup, final grading, grassing, planting, sidewalk construction, and paving shall have been completed and are ready for inspection.
 - 8. All deficiencies noted on inspection reports or nonconformances are corrected or the correction plan approved.
- B. When the conditions of paragraph 1.02 A. are met, the Contractor shall submit to the Engineer:
 - 1. A written notice that he considers the Work, or portion thereof, is substantially complete, and request an inspection.
 - 2. A punchlist of items to be corrected. (Uncompleted work which is not related to the safe, effective, efficient use of the Project may be allowed on the punchlist with the Engineer's approval.)
- C. Within a reasonable time after receipt of such notice, the Engineer will make an inspection to determine the status of completion.

D. Should the Engineer determine that the Work is not substantially complete:

1. The Engineer will promptly notify the Contractor in writing, giving the reasons therefor.
2. Contractor shall remedy the deficiencies in the Work and send another written notice of substantial completion to the Engineer.
3. The Engineer will, within reasonable time, reinspect the Work. The Contractor will be liable for reinspection fees as described in Paragraph 1.04, herein.

E. When the Engineer finds that the Work is substantially complete, he will:

1. Schedule a walk-through of the facility to include the Owner. Engineer shall determine the completeness of the punchlist and readiness of the facility for occupancy by the Owner.
2. Prepare and deliver to Owner a tentative Certificate of Substantial Completion with the tentative punchlist of items to be completed or corrected before final inspection.
3. After consideration of any objections made by the Owner as provided in Conditions of the Contract, and when the Engineer considers the Work substantially complete, he will execute and deliver to the Owner and the Contractor a definite Certificate of Substantial Completion with a revised tentative list of items to be completed or corrected. Any incomplete work allowed on a punchlist must be reinspected upon completion and any deficiencies found will be added to the punchlist.

1.03 FINAL INSPECTION

A. Prior to Contractor's request for a final inspection the following submittals and work must be complete:

1. Project Record Documents must be approved.
2. All spare parts and maintenance materials must be suitably delivered to the Owner per the requirements of the Technical Sections of the Specifications.
3. Contractor to submit evidence of compliance with requirements of governing authorities.

B. After satisfying the requirements of Paragraph 1.03 A. and when Contractor considers the Work complete, he shall submit written certification that:

1. Contract Document requirements have been met.
2. Work has been inspected for compliance with Contract Documents.
3. Work has been completed in accordance with Contract Documents.
4. Equipment and systems have been tested in the presence of the Owner's representative and are operational.
5. All punchlist items have been corrected or completed and the Work is ready for final inspection.

C. The Engineer will, within reasonable time, make an inspection to verify the status of completion after receipt of such certification.

D. Should the Engineer consider that the Work is incomplete or defective:

1. The Engineer will promptly notify the Contractor in writing, listing the incomplete or defective work.
2. Contractor shall take immediate steps to remedy the stated deficiencies and send another written certification to the Engineer that the Work is complete.

3. The Engineer will, within a reasonable amount of time, reinspect the Work and the Contractor shall be liable for reinspection fees as described in Paragraph 1.04, herein.

- E. When the Engineer finds that the Work is acceptable under the Contract Documents, the Contractor may make closeout submittals.

1.04 REINSPECTION FEES

- A. Should the Engineer perform reinspections due to failure of the Work to comply with the claims of status of completion made by the Contractor:
 1. Contractor will compensate the Owner for such additional services.
 2. Owner will deduct the amount of such compensation from the final payment to the Contractor.

1.05 CONTRACTOR'S CLOSEOUT SUBMITTALS

- A. Warranties and Bonds: To requirements of Section 01740.
- B. Evidence of Payment and Release of Liens: To requirements of General and Supplementary Conditions.
- C. Certificate of Insurance for Products and Completed Operations.

1.06 FINAL ADJUSTMENT OF ACCOUNTS

- A. Submit a final statement of accounting to the Engineer.
- B. Statement shall reflect all adjustments to the Contract Sum:
 1. The original Contract Sum.
 2. Additions and deductions resulting from:
 - a. Previous change orders or written amendments.
 - b. Allowances
 - c. Unit prices
 - d. Deductions for uncorrected work
 - e. Penalties and bonuses
 - f. Deductions for liquidated damages
 - g. Deduction for reinspection payments
 - h. Other adjustments
 3. Total Contract Sum, as adjusted.
 4. Previous payments.
 5. Sum remaining due.
- C. Engineer will prepare a final Change Order, reflecting approved adjustments to the Contract Sum, which were not previously made by Change Orders.

1.07 FINAL APPLICATION FOR PAYMENT

- A. Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in the Conditions of the Contract.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01710 CLEANING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: Execute cleaning, during progress of the Work and at completion of the Work.

1.02 DISPOSAL REQUIREMENTS

- A. Conduct cleaning and disposal operation to comply with codes, ordinances, regulations, and anti-pollution laws.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Use only those cleaning materials which will not create hazards to health or property, and which will not damage surfaces.
- B. Use only those cleaning material and methods recommended by manufacturer of the surface material to be cleaned.
- C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 – EXECUTION

3.01 DURING CONSTRUCTION

- A. Execute daily cleaning to keep the Work, the site and adjacent properties free from accumulations of waste materials, rubbish, and windblown debris, resulting from construction operations or personal activities.
- B. Provide on-site containers for the collection of waste materials, debris, and rubbish.
- C. Remove waste materials, debris, and rubbish from the site periodically, or as directed by the Owner, and dispose of at legal disposal areas away from the site.

3.02 DUST CONTROL

- A. The Contractor shall employ construction techniques to minimize the production and distribution of dust.
- B. Clean interior spaced prior to the start of finish painting and continue cleaning on an as-needed basis until painting is finished.
- C. Schedule operations so the dust and other contaminants resulting from cleaning process will not fall on wet or newly coated surfaces.

3.03 CLEANING

- A. Employ skilled workmen for final cleaning.
- B. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed interior and exterior surfaces.

- C. Prior to final completion, or Owner occupancy, Contractor shall conduct an inspection of sight-exposed interior and exterior surfaces and all work areas, to verify the entire Work is clean.

END OF SECTION

SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: Maintain at the site for the Owner one (1) record copy of:

1. Drawings.
2. Specifications.
3. Addenda.
4. Change Orders and other modifications of the Contract.
5. Engineer's Field Orders or written instructions.
6. Approved Shop Drawings, Working Drawings, and Samples.
7. Field test records.
8. Construction photographs.

B. Related Requirements Described Elsewhere:

1. Field Engineering: Section 01050
2. Shop Drawings, Working Drawings, and Samples: Section 01340
3. Construction Photography and Videos: Section 01380

1.02 DRAWINGS AND PROJECT MANUAL

A. Store documents and samples in Contractor's field office apart from documents used for construction.

1. Provide files and racks for storage of documents.
2. Provide locked cabinet or secure storage space for storage of samples.
3. Provide digital storage for electronic copies.

B. File documents and samples in accordance with CSI format with section numbers as provided herein.

C. Maintain documents in a clean, dry, legible, condition and in good order. Do not use record documents for construction purposes.

D. Always make documents and samples available for inspection by the Engineer or the Owner.

E. As a prerequisite for monthly Progress payments, the Contractor is to exhibit the currently updates "Record Documents" for review by the Engineer and Owner. Payment may be withheld if record documents are not satisfactorily maintained.

1.03 MARKING DEVICES

A. Provide marking pens for recording information in the color code designated by the Engineer.

1.04 RECORDING

- A. Label each document "PROJECT RECORD" with a rubber stamp having one (1) inch high letters.
- B. Record information concurrently with construction progress.
 - 1. Do not conceal any work until required information is recorded.
- C. Drawings: Legibly and clearly mark, to scale, each drawing to record actual construction:
 - 1. Depths of various elements of foundation in relation to finish first floor datum.
 - 2. All underground piping with elevations and dimensions. Changes to piping location. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements. Actual installed pipe material, class, etc.
 - 3. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.
 - 4. Field changes of dimension and detail.
 - 5. Changes made by Field Order or by Change Order.
 - 6. Details not on original Contract Drawings.
 - 7. Equipment and piping relocations.
 - 8. Major architectural and structural changes including relocation of doors, windows, etc.
 - 9. Architectural schedule changes according to Contractor's records and shop drawings.
- D. Specifications and Addenda: Legibly mark each section to record:
 - 1. Manufacturer, trade name, catalog number of Supplier of each product and item of equipment installed.
 - 2. Changes made by Field Order or by Change Order.
- E. Shop Drawings (after final review and approval): Provide an electronic copy of record shop drawings within the Operation and Maintenance Manual, for each process equipment, piping, electrical system and instrumentation system (see Section 01730).

1.05 SUBMITTAL

- A. At Contract closeout, deliver Record Documents to the Engineer for the Owner.
- B. Accompany submittal with transmittal letter, containing:
 - 1. Date.
 - 2. Project title and number.
 - 3. Contractor's name and address.
 - 4. Title and number of each Record Document.
 - 5. Signature of Contractor or his authorized representative.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01730

OPERATING AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. Compile product data and related information appropriate for Owner's maintenance and operation of products furnished under Contract.
 - a. Prepare operating and maintenance data as specified in this Section and as referenced in other pertinent sections of Specifications.
2. Instruct Owner's personnel in maintenance of products and in operation of equipment and systems.

B. Related Requirements Described Elsewhere:

1. Contract Closeout: Section 01700
2. Project Record Documents: Section 01720
3. Mechanical: Division 15

1.02 QUALITY ASSURANCE

A. Preparation of data shall be done by personnel:

1. Trained and experienced in maintenance and operation of described products.
2. Familiar with requirements of this Section.
3. Skilled as technical writer to the extent required to communicate essential data.
4. Skilled as draftsman competent to prepare required drawings.

1.03 FORM OF SUBMITTALS

A. Prepare data in form of an instructional manual for use by Owner's personnel.

B. Format:

1. Size: 8 ½ inches x 11 inches.
2. Paper: 20 pound minimum, white, for typed pages.
3. Text: Manufacturer's printed data, or neatly typed.
4. Drawings:
 - a. Provide reinforced punched binder tab, bind in with text.
 - b. Reduce larger drawings and fold to size of text pages; not larger than 14 inches x 17 inches.
5. Provide fly-leaf for each separate product, or each piece of operating equipment.
 - a. Provide typed description of projects and major component parts of equipment.

- b. Provide identified tabs.
- 6. Cover: Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". List:
 - a. Title of Project.
 - b. Identity of separate structure as applicable.
 - c. Identity of general subject mater covered in the manual.

C. Binders:

- 1. Commercial quality, three D-ring type binders with durable and cleanable white plastic covers. Binders shall be presentation type with clear vinyl covers on front, back, and spine. Binders shall include two sheet lifters and two horizontal inside pockets.
- 2. Maximum D-ring width: 2 inches
- 3. When multiple binders are used, correlate the data into related consistent groupings.

- D. In addition to standard operation and maintenance manuals, all manufacturers supplying equipment specified in Division 15 shall submit their operation and maintenance manuals on USB drive, in a Microsoft Word, or text, ".txt" formats. All graphic files shall be in PDF, JPEG, DWG, or DXF formats.

1.04 CONTENT OF MANUAL

A. Neatly typed table of contents for each volume, arranged in systematic order.

- 1. Contractor, name of responsible principal, address, and telephone number.
- 2. A list of each product required to be included, indexed to content of the volume.
- 3. List, with each product, name address, and telephone number of:
 - a. Subcontractor, manufacturer and installer name, addresses, and telephone numbers.
 - b. A list of each products required to be included, indexed to content of the volume.
 - c. Identify area of responsibility of each.
 - d. Local source of supply for parts and replacement equipment including name, address, and telephone numbers.
- 4. Identify each product by product name and other identifying symbols as set forth in Contract Documents.

B. Product Data:

- 1. Include only those sheets which are pertinent to the specific product.
- 2. Annotate each sheet to:
 - a. Clearly identify specific product or part installed.
 - b. Clearly identify data applicable to installation.
 - c. Delete references to inapplicable information.
- 3. Operation and maintenance information as herein specified.
- 4. Record shop drawings as submitted and approved with all corrections made of reach product.

C. Drawings:

1. Supplement product data with drawings as necessary to clearly illustrate:
 - a. Relations of component parts of equipment and systems.
 - b. Control and flow diagrams.
2. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.
3. Do not use Project Record Documents as maintenance drawings.

D. Written test, as required to supplement product data for the particular installation:

1. Organize in consistent format under separate headings for different procedures.
2. Provide logical sequence of instruction of each procedure.

E. Copy of each warranty, bond service contract issued.

1. Provide information sheet for Owner's personnel, give:
 - a. Proper procedures in event of failure.
 - b. Instances which might affect validity of warranties or bonds.

1.05 MANUAL FOR MATERIALS AND FINISHES

A. Submit an electronic copy of complete manual in final form.

B. Content: for architectural products, applied materials, and finishes:

1. Manufacturer's data, giving full information on products.
 - a. Catalog number, size, composition.
 - b. Color and texture designations.
 - c. Information required for reordering special manufacturing products.
2. Instructions for care and maintenance.
 - a. Manufacturer's recommendation for types of cleaning agents and methods.
 - b. Cautions against cleaning agents and methods which are detrimental to product.
 - c. Recommended schedule for cleaning and maintenance.

C. Content for moisture protection and weather-exposed products:

1. Manufacturer's data, giving full information on products.
 - a. Applicable standards.
 - b. Chemical composition.
 - c. Details of installation.
2. Instruction for inspection, maintenance, and repair.

D. Additional requirements for maintenance data: Respective sections of Specifications.

1.06 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Submit an electronic copy of complete manual in final form.
- B. Content, for each unit of equipment and system, as appropriate:
 - 1. Description of unit and component parts.
 - a. Function, normal operating characteristics, and limiting conditions.
 - b. Engineering data and tests.
 - c. Complete nomenclature and commercial number of replaceable parts.
 - d. Summary of information listed on equipment and motor data plates.
 - 2. Operating procedures:
 - a. Start-up, break-in, routine, and normal operating instructions.
 - b. Regulation, control, stopping, shutdown, and emergency instructions.
 - c. Summer and winter operating instructions.
 - d. Special operating instructions.
 - 3. Maintenance procedures:
 - a. Routine operations.
 - b. Guide to "trouble-shooting".
 - c. Disassembly, repair, and reassembly.
 - d. Alignment, adjusting, and checking.
 - 4. Servicing and lubrication required.
 - 5. Manufacturer's printed operating and maintenance instructions.
 - 6. Description of sequence of operation by control manufacturer.
 - 7. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.
 - a. Predicted life of parts subject to wear.
 - b. Items recommended to be stocked as spare parts.
 - 8. As-installed control diagrams by controls manufacturer.
 - 9. Each Contractor's coordination drawings.
 - a. As-installed color-coded piping diagrams.
 - 10. Charts of valve tag numbers, with location and function of each valve.
 - 11. List of original manufacturer's spare parts, manufacturer's current prices and recommended quantities to be maintained in storage.
 - 12. Other data as required under pertinent sections of specifications.

13. Approved record shop drawings with all corrections made, and a copy of the warranty statement, checkout memo, demonstration test procedures and demonstration test certification.

C. Content, for each electric and electronic systems, as appropriate:

1. Description of system and component parts.
 - a. Function, normal operating characteristics, and limiting conditions.
 - b. Engineering data and tests.
 - c. Complete nomenclature and commercial number of replaceable parts.
2. Circuit directories and panelboards.
 - a. Electrical service.
 - b. Controls.
 - c. Communications.
3. As-installed color-coded wiring diagrams.
4. Operating procedures:
 - a. Routine and normal operating instructions.
 - b. Sequences required.
 - c. Special operating instructions.
5. Maintenance procedures:
 - a. Routine operations.
 - b. Guide to "trouble-shooting".
 - c. Disassembly, repair, and reassembly.
 - d. Adjustment and checking.
6. Manufacturer's printed operating and maintenance instructions.
7. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
8. Other data as required under pertinent sections of specifications.

D. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel.

E. Additional requirements for operating and maintenance data: Respective sections of Specifications.

1.07 SUBMITTAL SCHEDULE

- A. Submit an electronic copy of preliminary draft of proposed formats and outlines of contents of Operation and Maintenance manuals within 90 days after Notice to Proceed.
- B. Submit an electronic copy of completed data in preliminary form no later than 20 days following Engineer's review of the last shop drawing of a product and/or other submittal specified under Section 01340, but no later than delivery of equipment. A copy will be returned with comments to be incorporated into the final copies.

- C. Submit an electronic copy of approved manual in final form directly to the offices of the Engineer, Halff Associates, Inc., within 10 days after the reviewed copy of last item of the reviewed copy is returned.
- D. Provide an electronic copy of addenda to the operation and maintenance manuals as applicable and certificated as specified within 30 days after final inspection.

1.08 INSTRUCTION OF OWNER'S PERSONNEL

- A. Prior to demonstration test, fully instruct Owner's designated operating and maintenance personnel in operation, adjustment and maintenance of products, equipment and systems.
- B. Operating and maintenance manual shall constitute the basis of instruction. Review contents of manual with Owner's operating and maintenance personnel in full detail to explain all aspects of operations and maintenance.
- C. Instructors shall be fully qualified personnel as outlined within the individual equipment specifications. If no specific training specifications are listed with the equipment, the Contractor shall provide the instruction with qualified Contractor personnel.
- D. The Contractor shall provide a list to the Owner indicating the date, time and instructors that will be present for all training sessions.
- E. The instructors shall provide for and prepare lesson scopes and handouts for up to five individuals designated by the Owner that outline the items to be covered. Separate sessions for operation and maintenance instruction shall be provided consecutively. Handouts shall be submitted to the Owner with at least one week's notice prior to the training sessions.
- F. All instruction sessions shall be video recorded with portable video recording cameras supplied by the Contractor. Video recording shall be made by the Contractor under the direction of the Owner.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01740

WARRANTIES AND BONDS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Related Work Described Elsewhere:

1. Contract Closeout: Section 01700

1.02 SUBMITTAL REQUIREMENTS

A. Assemble warranties, bonds, and services and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors.

B. Number of original signed copies required: Check with Client on desired amount (REMOVE IF NO COPIES ARE REQUIRED)

C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.

1. Product of Work item.
2. Firm, with name of principal, address, and telephone number.
3. Scope.
4. Date of beginning of warranty, bond, or service maintenance contract.
5. Duration of warranty, bond, service maintenance contract.
6. Provide information for Owner's personnel:
 - a. Proper procedure in case of failure.
 - b. Instances which might affect the validity of warranty or bond.
7. Contractor, name of responsible principal, address, and telephone number.

1.03 FORM OF SUBMITTALS

A. Prepare in duplicate packets.

B. Format:

1. Size 8 ½ inches by 11 inches, punch sheets for standard three (3) ring binder.
 - a. Fold larger sheets to fit into binders.
2. Cover: Identify each packet with typed or printed title "WARRANTIES AND BONDS". List:
 - a. Title of Project.
 - b. Name of Contractor.

C. Binders: Commercial quality, three (3) D-ring type binders with durable and cleanable white plastic covers and maximum D-ring width of two (2) inches. Binders shall be presentation type with clear vinyl covers on front, back, and spine. Binders shall include two sheet lifters and two horizontal inside pockets.

1.04 WARRANTY SUBMITTALS REQUIREMENTS

- A. For all major pieces of equipment, submit a warranty from the equipment manufacturer. The manufacturer's warranty period shall be concurrent with the Contractor's for twelve (12) months, unless otherwise specified, commencing at the time of final acceptance by the Owner.
- B. The Contractor shall be responsible for obtaining certificates for equipment warranty for all major equipment specified under Division 15: Mechanical. The Engineer reserves the right to request warranties for equipment not classified as major. The Contractor shall still warrant equipment not considered to be "major" in the Contractor's one-year warranty period even though certificates of warranty may not be required.
- C. In the event the equipment manufacturer or supplier is unwilling to provide a twelve (12) month warranty commencing at the start of the Correction Period, the Contractor shall obtain from the manufacturer a two (2) year warranty commencing at the time of equipment delivery to the job site. This two (2) year warranty from the manufacturer shall not relieve the Contractor of the one (1) year warranty, starting at the time of Owner's acceptance of the equipment.
- D. The Owner shall incur no labor or equipment cost during the guarantee period.
- E. Guarantee shall cover all necessary labor, equipment, materials, and replacement parts resulting from faulty or inadequate equipment design, improper assembly or erection, defective workmanship and materials, leakage, breakage or other failure of all equipment and components furnished by the manufacturer or the Contractor.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 02050

DEMOLITION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. This Section includes furnishing labor, materials, equipment, and incidentals required for demolition of various existing components as shown on the Drawings.
2. This Section provides for the complete or partial removal and disposal of specified existing structures, foundations, slabs, piping, mechanical equipment, electrical systems, and miscellaneous appurtenances encountered during demolition operations.
3. The Contractor shall be responsible for:
 - a. Removal and proper disposal of all demolished contents.
 - b. Removal and disposal of structures, piping, and equipment as designated on the Drawings.
 - c. Termination and plugging of abandoned subsurface piping.
 - d. Termination of abandoned elective facilities in accordance with local codes and the NEC.
 - e. Termination and plugging of abandoned subsurface potable and non-potable water piping.
 - f. Site restoration.
4. The Contractor shall examine the various drawings regarding the proposed site, visit the proposed site and determine for himself the extent of the demolition work, the extent work whichever is affected therein and all conditions under which he is required to perform the various operations.

1.02 PERMITS AND NOTICES

- A. Permits and Licenses: Contractor shall obtain all necessary permits and licenses for performing the demolition work and shall furnish a copy of same to the Engineer prior to commencing the work. The Contractor shall comply with the requirements of the permits.
- B. Notices: Contractor shall issue written notices of planned demolition to companies or local authorities owning utility conduit, wires or pipes running to or through the project site. Copies of said notices shall be furnished to the Engineer.
- C. Utility Services: Contractor shall notify in writing utility companies or local authorities furnishing gas, water, electrical, telephone or sewer service to remove any equipment owned by them in structures to be demolished and to remove, disconnect, cap or plug their services to facilitate demolition. Copies of said notices shall be furnished to the Engineer.

1.03 CONDITIONS OF STRUCTURES

- A. Conditions existing at the time of inspection for bidding purposes will be maintained by the Owner insofar as practicable. However, variation among the structures may occur prior to the start of demolition work.

1.04 RULES AND REGULATIONS

- A. The Standard Building Code shall control the demolition, modification, or alteration of the existing buildings or structures.
- B. No blasting shall be done on site. The Contractor shall not bring or store any explosives on site.

1.05 DISPOSAL OF MATERIAL

- A. Salvageable material shall become the property of the Owner, if the Owner so requests. The Contractor shall dismantle all materials to such a size that it can be readily handled and deliver any of this salvageable material requested by the Owner to a storage area designated by the Owner.
- B. The following materials are examples of the type the Owner desires to keep:
 - 1. List materials Owner wishes to keep
- C. Any materials the Owner rejects shall become the Contractor's property and must be removed from the site.
- D. Waste concrete and masonry shall be hauled to a legal disposal site by the Contractor.
- E. All other waste metal, wood, and other material shall be hauled to a waste disposal site by the Contractor.
- F. The storage of or sale of removed items on the site shall not be allowed.

1.06 SUBMITTALS

- A. The Contractor shall submit to the Engineers for approval, the proposed demolition and removal plan for the structures and modifications as shown on the Drawings or as specified herein prior to the start of work. The Contractor shall include in the schedule the coordination of shutoff, capping and continuation of utility service as required. The demolition and removal plan shall include as a minimum, the following.
 - 1. A detailed sequence of demolition and removal Work to ensure the uninterrupted progress of the Park operations and the expeditious completion of the Work.
 - 2. Written evidence of approval by the Owner of the work plan.
 - 3. Sequencing and coordination of the Work with inspections and subsequent repairs.
- B. Before commencing work, all modifications necessary to bypass the facilities to be demolished shall be completed. Contractor shall coordinate with the Owner's personnel to determine the locations of the relevant valves and fittings.

1.07 TRAFFIC AND ACCESS

- A. The Contractor shall conduct demolition and modification operations, and the removal of equipment and debris to ensure minimum interference with roads, streets and walks, both on-site and off-site, and to ensure minimum interference with occupied or used facilities.
- B. The Contractor shall direct special attention towards maintain safe and convenient access to the existing site.
- C. Before the necessary closure of any street or sidewalk, the Contractor must obtain all ROW permits from the City of Leesburg.

1.08 EXISTING UTILITIES

- A. The Contractor shall cooperate with the Owner and utility companies to shut off utilities serving structures of the existing facilities as required by demolition operations.
- B. The Contractor shall be solely responsible for making all necessary arrangements and for performing any necessary work involved in connection with the discontinuance or interruption of all public and private utilities or services under the jurisdiction of the County or utility companies.

1.09 POLLUTION CONTROL

- A. The Contractor shall use water sprinkling, temporary enclosures, and/or other suitable methods as necessary to limit the amount of dust rising and scattering in the air to the lowest level practical. The Contractor shall comply with the governing regulations governing such nuisances.
- B. The Contractor shall clean up all dust, dirt and debris caused by demolition operations. The Contractor shall return all plant and adjacent areas to conditions existing prior to the start of work.

PART 2 – MATERIALS (NOT USED)

PART 3 – EXECUTION

3.01 SEQUENCE OF WORK

- A. The sequence of demolition and renovation of existing facilities shall proceed in accordance with the approved demolition and removal plan specified in Paragraph 1.06 of this Section.

3.02 REMOVAL OF EXISTING PROCESS EQUIPMENT, PIPING, AND APPURTENANCES

- A. Existing equipment, non-buried valving and piping, and appurtenances shall be removed or abandoned in-place as shown or indicated on the Drawings, and as specified herein.
- B. All non-buried equipment, piping and appurtenances shall be cleaned. Equipment to be retained by the Owner as specified in Paragraph 1.05, above, shall be dismantled sufficiently to permit thorough cleaning. All valves shall be left open.

3.03 QUALITY CONTROL

- A. The Contractor shall protect all existing materials and equipment to be salvaged or reused from damage.
- B. The Contractor shall cap or plug all lines to be abandoned as shown on the drawings. The Contractor shall place covers and label all junction boxes, conduits, and wire as abandoned.
- C. The Contractor shall promptly repair any and all damage caused to remaining facilities at no cost to the Owner.

END OF SECTION

SECTION 02090

SOIL BORINGS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Soil boring data consisting of reproductions of boring logs were made for the Engineer by Andreyev Engineering, Inc., report titled "Proposed Water Main Project, the City of Leesburg, U.S. Highway 27" date June 15, 2023. A copy of the complete soils report is included separately from these specifications.
- B. The boring data has been used by the Engineer for the design of the structural foundations.
- C. The subsurface information contained herein was obtained for design purposes and may not be an adequate representation of actual conditions for project construction. Information shown, including water levels, represents existing conditions at the specific boring locations at the time the borings were made. All risks resulting from use or interpretation of the subsurface data shown shall be borne by the Contractor.
- D. The data is included for information only and may be useful as a guide in estimating and planning the Work.
- E. If additional subsurface information is required by the Bidder/Contractor, shall be the Bidder's/Contractor's responsibility to obtain such data.
- F. Refer to the General Conditions for further explanation of subsurface conditions.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 02110 CLEARING, GRUBBING, AND STRIPPING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: This Section described the Work included in clearing, grubbing, stripping, and otherwise preparing the project site for construction operations.
- B. Related Work Specified Elsewhere:
 - 1. Earthwork: Section 02200
- C. Definitions:
 - 1. Clearing: Remove and dispose of shrubs, brush, limbs, and other vegetative growth. Remove all evidence of their presence from the surface including sticks and branches. Remove and dispose of trash piles and rubbish currently scattered over the construction site or collects there during construction. Protect trees, shrubs, vegetative growth, and fencing which are not designed for removal. Clearing operations shall be conducted to prevent damage to existing structures and installations, and to those under construction, so as to provide for safety of employees and others.
 - 2. Grubbing: Grubbing shall consist of the complete removal of all stumps, roots larger than 1-1/2 inches in diameter, matted roots, brush, timber, logs, and any other organic or metallic debris remaining after clearing not suitable for foundation purposes, resting on, under or protruding through the surface of the ground to a depth of 18 inches below the subgrade. All depressions excavated below the original ground surface for or by the removal of such objects, shall be refilled with suitable materials and compacted to a density conforming to the surrounding ground surface.
 - 3. Stripping: Remove and dispose of all organics and sod, topsoil, grass, and grass roots, and other objectionable material remaining after clearing and grubbing from the areas designated to be stripped. Grass, grass roots and organic material in areas to be excavated or filled shall be stripped to the depth as noted in the soils report. In areas so designated, topsoil shall be stockpiled. Strippings and other unsuitable material, such as Deet, shall be disposed of by the Contractor unless directed otherwise by the Engineer.

PART 2 – MATERIALS

2.01 GENERAL

- A. Trees and Shrubbery: The full extent of trees and shrubbery, and other vegetative material is not shown on the Drawings: Inspect the site so as to determine the nature, location, size, and extent of vegetative material to be removed or preserved, as specified herein. Preserve, in place, trees that are specifically shown on the Drawings and designated to be preserved.
- B. Preservation of Trees, Shrubs, and Other Plant Material:
 - 1. All plant materials (trees, shrubbery, and plants) beyond the limits of clearing and grubbing shall be saved and protected from damage resulting from the work. To protect from damage and soil compaction, no filling, excavating, trenching, or stockpiling of materials will be permitted within the drip line of these plant materials. The drip line is defined as a circle drawn by extending a line vertically to the ground from the outermost branches of a plant or group of plants.

2. When trees are close together, restrict entry to area within drip line by fencing. In areas where no fence is erected, the trunks of all trees 2 inches or greater in diameter shall be protected by encircling the trunk entirely with boards held securely by 12-gauge wire and staples. This protection shall extend from ground level to a height of 6 feet. Cut and remove tree branches where such cutting is necessary to affect construction operation. Remove branches other than those required to affect the work to provide a balanced appearance of any tree. Scars resulting from the removal of branches shall be treated with a tree sealant

PART 3 – EXECUTION

3.01 GENERAL

- A. Clearing and Grubbing Limits: All excavation areas associated with new structures, slabs. And roadways shall be cleared and grubbed to the following depths:
 1. Roadway and Paved Area: 2 feet below existing grade and replace with compacted backfill.
 2. Proposed Structures: 2 feet below existing grade within a 5-foot margin beyond each structure, dimension, and replaced with compacted backfill as specified herein.
 3. Building Site Areas not specifically noted above: 2 feet below existing grade and replaced with compacted backfill as specified herein.
 4. All other areas: 1 foot below completed surface grade.
- B. Disposal of Clearing and Grubbing Debris: No burning of combustible materials will be allowed. Remove all cleared and grubbed material from the work site and dispose of at an approved site.
- C. Areas to be Stripped: All excavation and embankment areas associated with new structures, slabs, walks, and roadways shall be stripped. Stockpile areas shall be stripped.
- D. Disposal of Strippings: Remove all stripped material and dispose off-site, at an approved location unless otherwise directed.

END OF SECTION

SECTION 02140

DEWATERING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: The Work to be performed under this Section shall include the design and installation of temporary dewatering system until completion of construction to remove subsurface waters from structure or utility trench excavations as required.

1.02 QUALITY ASSURANCE

- A. Qualifications: The temporary dewatering system, if necessary, shall be designed by a firm who regularly engages in the design of dewatering systems and who is fully experienced, reputable, and qualified in the design of such dewatering systems. The firm shall have a successful record of operation for a minimum of five (5) years prior to bid date. The design firm shall supply the Engineer with previous installation details of at least three (3) successful dewatering operations of a similar nature in the State of Florida.
- B. In lieu of experience, the Contractor shall provide a performance and warranty bond for 1.0 times the total installed cost of the temporary dewatering system. This bond shall be executed prior to award and/or contract execution.
- C. Standards: The dewatering of any excavation area and the disposal of water during construction, shall be in strict accordance with all local and state government rules and regulations. If a consumptive use permit is required by local Water Management District, the Contractor shall be responsible for obtaining said permit.

1.03 SUBMITTALS

- A. Submit to the Engineer for review, the proposed methods of construction, including dewatering, excavation, bedding, filling, compaction, and backfilling for the various portions of the work. Review shall be for method only. The Contractor shall remain responsible for the adequacy and safety of the methods.
- B. Submittals shall be in accordance with Section 01340, and shall include the following:
 - 1. Design Notes and Drawings.
 - 2. Descriptive literature of the temporary dewatering system.
 - 3. Layout of all piping involved.
 - 4. Observation well locations.

1.04 CRITERIA

- A. The dewatering system shall be developed to the point that can dewater the site surrounding all structures or utility trenches as shown on the Drawings. Each wellpoint system shall be capable of dewatering and maintaining groundwater levels at the respective excavations. Observation wells shall be constructed for the purpose of testing each system.
- B. Observation Wells:
 - 1. Prior to excavation, the Contractor shall install groundwater observation wells at locations as directed by the Contractor's Geotechnical Engineer, and as approved by the Engineer adjacent

to structures under construction for the purpose of measuring water levels during excavations. The observation well shall consist of screen, casing and cap of approved size and material of construction. The observation well shall be placed in a 2 1/2-inch bore hole which shall be carried to an elevation of at least the final bottom grade of structure. The annular space surrounding the intake point and the riser pipe shall be sealed in such a way as to prevent infiltration from surface water. The observation well shall be developed in such a manner as to ensure proper indication of subsurface water levels adjacent to the well.

2. The Contractor shall be responsible for maintaining the observation wells and for observing and recording the elevation of groundwater in them until adjacent structure of utilities are completed and backfilled. Each observation well shall be observed and recorded daily. Measurements shall be supplied daily to the Engineer. The Engineer may require the observation wells reflect true groundwater levels by adding water to the well then recording the drop in the level from the time the water was added. Any plugged observation well shall be redeveloped, if necessary, to indicate true groundwater levels.
3. Observation well shall be abandoned when directed by the Engineer, and in a manner acceptable to the Engineer.

1.05 PUMPING AND DRAINAGE

- A. The Contractor shall, at all times during construction, provide and maintain proper equipment and facilities to remove all water entering excavations, and shall keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the fills, structures or pipes to be built thereon have been completed to such extent they will not be floated or otherwise damaged by allowing water levels to return to natural levels. The Contractor shall submit to the Engineer, for review, a plan for dewatering systems prior to commencing work. The dewatering system installed shall be in conformity with overall construction plan, and certification of this shall be provided by a Geotechnical Engineer. The Geotechnical Engineer shall be required to monitor the performance of the dewatering systems during the progress of the work and require such modifications, as may be required, to assure that the systems are performing satisfactorily.
- B. Dewatering shall always be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation and to preserve the integrity of adjacent structures. As a minimum, the water level shall be two (2) feet below the trench bottom. Well or sump installations shall be constructed with proper sand filters to prevent drawing of finer grained soil from the surrounding soils.
- C. Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and pumped from the excavation to maintain a bottom free from standing water.
- D. The Contractor shall take all additional necessary precautions and prevent uplift of any structure during construction.
- E. The conveying of water, other than stormwater surface runoff, in open ditches or trenches will not be allowed. Permission to use any storm sewers, or drains, for water disposal purposes shall be obtained from the controlling authority. Any requirements and costs for such use shall be the responsibility of the Contractor. However, the Contractor shall not cause flooding by overloading or blocking up the flow in the drainage facilities, and the Contractor shall leave the facilities unrestricted and as clean as originally found. Any damage to facilities shall be repaired or restored at no cost to the Owner.

- F. Flotation shall be prevented by the Contractor by maintaining a positive and continuous operation of the dewatering system. The Contractor shall be full responsible and liable for all damages which may result from failure of this system.
- G. Removal of dewatering equipment shall be accomplished after the Contractor and the Engineer agree the system is no longer required. The material and equipment constituting the system shall be removed by the Contractor.
- H. The Contractor shall take all necessary precautions to preclude the accidental discharge of fuel, oil, or other contaminants to prevent adverse effects on groundwater or receiving water quality.

PART 2 – PRODUCTS

2.01 GENERAL

- A. The equipment specified herein shall be standard dewatering equipment of proven ability as designed, manufactured, and installed by firms having experience in the design and production of such equipment. The equipment furnished shall be designed, constructed, and installed in accordance with the best practices and methods.
- B. The Contractor shall engage a Professional Engineer registered in the State of Florida, to design the temporary dewatering system for all structures. The Contractor shall submit a conceptual plan for the dewatering system prior to commencing work. The dewatering system installed shall be in conformity with the overall construction plan and the certification of this shall be provided by the Geotechnical Engineer. The Geotechnical Engineer shall be required to monitor the performance of the dewatering system, at the Contractor's expense, during the progress of the work and require such modifications as may be required to assure the systems will perform satisfactorily. Dewatering system shall be designed in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at the proposed structures or utilities, and to preserve the integrity of any adjacent structures.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Dewatering: The Contractor shall install the approved dewatering system for the removal of subsurface water encountered during construction of the proposed structures or utilities.
- B. Consumptive Use Permit (CUP): If pumping requirements exceed certain limits, the Contractor shall pay for and obtain a CUP from the local water management district for such pumped volumes.

3.02 PROTECTION AND SITE CLEAN-UP

- A. At all times during the progress of the work the Contractor shall use all reasonable precautions to prevent either tampering with the wellpoints (if used) or the entrance of foreign material into the site's storm drain system.
- B. Immediately upon completion of the dewatering operations, the Contractor shall remove all his equipment, materials, and supplies from the site of the work, remove all surplus materials and debris, fill in all holes or excavations, and grade the site to elevations of the surface levels which existed before the work started. The site shall be thoroughly cleaned and graded as directed by the Engineer.

END OF SECTION

SECTION 02200

EARTHWORK

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: This Section includes materials, testing, and earthwork for excavations, fills, and embankments.
- B. Related Work Specified Elsewhere:
 - 1. Excavation, Backfilling, and Compaction: Section 02220.
 - 2. Dewatering: Section 02140.

1.02 SUBMITTALS

- A. Submit excavation and shoring drawings for worker protection in accordance with the Section 01340: Shop Drawings, Working Drawings and Samples.
- B. Submit an electronic copy of a report from a testing laboratory verifying any off-site borrow material conforms to the gradation specified.

1.03 TESTING REQUIREMENTS

- A. Determination of laboratory moisture-density relationship and maximum density shall be by the Modified Proctor Method of ASTM D-1557. At least one (1) test per soil type shall be made.
- B. In place soil density shall be determined either by use of a Nuclear Density Meter per ASTM D-6938 or by use of the Drive Sleeve Method per ASTM D-2937. In place field densities shall be taken at one (1) every 5,000 square feet and at not greater than 1-foot vertical intervals for all fill areas under structures and pavement. One (1) density test is required for each pad or isolated footing and for every 20 linear feet of strip/wall footing length.
- C. Compaction shall be deemed to comply with the Specifications when no tests fall below the specified relative compaction. The Contractor shall pay the costs of any retesting of work not conforming to the Specifications.
- D. Relative compaction is defined as the ratio, expressed as a percentage, of the in-place density to the laboratory maximum density.
- E. Density tests will be made for determination of specified compaction by an independent testing laboratory provided by the Contractor as approved by the Engineer. Tests will be made in locations reviewed and approved by the Engineer. If any tests are unsatisfactory, re-excavate and recompact the fill or backfill until the desired compaction is obtained. Additional compaction tests will be taken to each side of an unsatisfactory test, at locations approved by the Engineer, to determine the extent of re-excavation and re-compaction necessary.

PART 2 – PRODUCTS

2.01 FILL AND BACKFILL

- A. Fill and backfill shall be clean, granular sand that is free from organic matter, roots, debris, and rocks larger than three inches in the greatest dimension and having less than 10 percent (10%) passing the No. 200 U.S. sieve size.
- B. Water for Compaction: Water shall be free of acid, alkali, or organic materials and shall have a pH of 7.0 to 9.0, a maximum chloride concentration of 500 mg/l, and a maximum sulfate concentration of 500 mg/l. Provide all water needed for earthwork. Contractor shall provide temporary piping and valves to convey water from the source to the point of use and any meters if the water is taken from a water district or agency pipeline.

PART 3 – EXECUTION

3.01 COMPACTION REQUIREMENTS

- A. Unless otherwise specified or shown on Drawings, compact fill, embankments, and backfills to 95 percent (95%) Modify Proctor Density.
- B. Dewatering: Provide and operate equipment adequately to keep excavations and trenches free of water per Section 02140. Remove water during period when concrete is being deposited, when pipe is being laid, during the placing of structural fill and backfill, and for inspection/testing of the structural subgrade. Avoid settlement or damage to adjacent property.
- C. Excavation is unclassified. Perform all excavation regardless of the type, nature, or condition of the material encountered to accomplish the construction.
- D. Placing and Compacting Fill Material:
 - 1. Excavated material which conforms to the specifications may be used for fill or backfill.
 - 2. Place all materials at optimum moisture content.
 - 3. Compact each lift to the extent specified.
- E. Foundation Requirements:
 - 1. All structure foundation bottoms shall be recompact and retested after excavation to densify soils loosened in the excavation process.
 - 2. Soils placed adjacent to footings or walls shall be carefully compacted to avoid damaging the footing or wall. Approved structural sand fills placed in footing excavations above the bearing level, in trench of pipeline excavations within the structure area plus 10 feet beyond the perimeter walls, and in other areas which are expected to provide slab support and/or foundation embedment constraint shall be placed in loose lifts not exceeding 6 inches.
- F. Moisture Control of Earth Material: During the compaction operations, maintain optimum practicable moisture content required for compaction purposes in each lift of the material. Maintain moisture content uniform throughout the lift. Insofar as practicable, add water to the material at the site of excavation. Supplement by sprinkling the material. At the time of compaction, the water content of the material shall be at optimum water content or within 2 percentage points above optimum. Aerate material containing excessive moisture by blading, discing, or harrowing to hasten the drying process.

G. Site Grading:

1. Perform earthwork to the lines and grades shown on the Drawings. Shape, trim, and finish slopes to conform with the lines, grades and cross-sections as shown on the Drawings. Make slopes free of exposed roots and loose rocks exceeding 3 inches in diameter. Round tops of banks to circular curves to not less than a 5-foot radius.
2. Neatly and smoothly trim rounded surfaces. Do not over excavate and backfill to achieve the proper grade.
3. Final grades shall be within 0.1 foot of the required elevation.

H. Disposal of Excess Excavation: Dispose of excess excavated suitable materials at designated on-site soil areas indicated on the Drawings or directed by the Engineer. If on-site disposal is not indicated or directed by the Engineer, dispose of excess excavated materials off-site. Contractor shall make his own arrangements for the disposal of all excess, suitable or unsuitable, material and bear all costs incidental to such disposal.

END OF SECTION

SECTION 02220

EXCAVATION, BACKFILLING, AND GRADING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: The Work included under this Section consists of dewatering, excavating, trenching, sheeting/shoring, grading, backfilling, and compacting those soil materials required as shown on the Drawings and specified herein.
- B. Definitions:
1. Maximum Density: Maximum weight in pounds per cubic foot of a specific material.
 2. Optimum Moisture Content: The optimum moisture content shall be determined by ASTM D 1557 specified to determine the maximum dry density for relative compaction. Field moisture content shall be determined on the basis of the fraction passing the $\frac{3}{4}$ inch sieve.
 3. Rock Excavation: Excavation of any hard natural substance which requires the use of special impact tools such as jack hammers, sledges, chisels or similar devices specifically designed for use in cutting or breaking rock, but exclusive of trench excavating machinery.
 4. Suitable: Suitable materials for fills shall be classified as A-1, A-3 or A-2-4 in accordance with AASHTO Designation M-145 and shall be free from vegetation, organic material, marl, silt or muck. Not more than 10 percent (10%) by weight of fill material shall pass the No. 200 Sieve. The Contractor shall furnish all additional fill material required.
 5. Unsuitable: Unsuitable materials are classified as A-2-5, A-2-6, A-2-7, A-4, A-5, A-6, A-7, and A-B in accordance with AASHTO Designation M-145.
- C. Plan for Earthwork:
1. The Contractor shall be responsible for having determined to his satisfaction, prior to the submission of his bid, the conformation of the ground, the character and quality of the substrata, the types and quantities of materials to be encountered, the nature of the groundwater conditions, the prosecution of the work, the general and local conditions and all other matters which can in any way affect the Work under this Contract according to the General Conditions.
 2. Prior to commencing the excavation, the Contractor shall submit a plan of his proposed operations to the Engineer for review. The Contractor shall reflect the equipment and methods to be employed in the excavation. Prices established in the Proposal for the Work to be done will reflect all costs pertaining to the Work. No claims for extras based on substrata or groundwater table conditions will be allowed.
- D. Trench Safety Act: The Contractor shall comply with all the requirements of the Florida Trench Safety Act (Chapter 553, Part III, laws of Florida). The Contractor shall acknowledge included in various items of his bid proposal and in the total bid price are costs for complying with the provisions of the Act. Additionally, the Contractor is required to break out the costs for complying with the Florida Trench Safety Act. FAILURE TO COMPLY WITH THE REQUEST IN THIS SECTION SHALL RESULT IN THE BID BEING DECLARED NONRESPONSIVE. Failure to comply with the provisions of the Act shall result in a per item penalty of \$1,000 per day that the work is out of compliance.

1.02 APPLICABLE PUBLICATION

- A. All publications and standard specifications referred to herein are the latest or current issue of that publication or specification as of the specification date.

1.03 QUALITY ASSURANCE

- A. The requirements for testing and laboratory services are specified in Section 01410: Testing and Testing Laboratory Services.

1.04 FEDERAL AND STATE REGULATORY REQUIREMENTS

- A. All trench excavations which exceed 4 feet in depth shall comply with the applicable trench safety standards as stated in the OSHA excavation safety standards 29 CFR S. 1926.650 Subpart P as regulated and administered by the Florida Department of Labor and Employment Security as the "Florida Trench Safety Act.

1.05 JOB CONDITIONS

- A. If, in the opinion of the Engineer, conditions encountered during construction warrant a change in the footing elevation, or in the depth of removal of unsuitable material from that indicated in the soils report, an adjustment will be made in the contract price, as provided in the General and Special Conditions.

1.06 PROTECTION

- A. Pre-Construction Survey:
 - 1. Prior to commencing excavation, backfill or dewatering, the Engineer and Contractor shall jointly conduct a survey of those existing structures which, in the opinion of the Engineer, may be subject to settlement or distress resulting from excavation or dewatering operations.
 - 2. The Engineer will monitor the structures surveyed to ascertain evidence of settlement or distress. If settlement or distress becomes evident, the Contractor shall be required to repair the structures to the previous condition to the satisfaction of the Engineer. Costs shall be paid by the Contractor.

1.07 SUBMITTALS

- A. Submit to the Engineer for review the proposed methods of construction, including dewatering, excavation, bedding, filling, compaction, and backfilling for the various portions of the work. Review shall be for method only. The Contractor shall remain responsible for the adequacy and safety of the methods.

PART 2 – PRODUCTS

2.01 SUBMITTALS

- A. General:
 - 1. All fill material from on and off-site sourced shall be subject to the approval of the Engineer.
 - 2. All fill material shall be unfrozen and free of organic material, trash, or other objectionable material. Excess or unsuitable material, as designated by the Engineer, shall be removed from the job site by the Contractor.
- B. Common Fill Material:
 - 1. Shall be sand not containing stones, rock, concrete, or other rubble larger than 2 inches in diameter. It shall have physical properties which allow it to be easily spread and compacted.

2. The Contractor shall utilize as much excavated material as possible for reuse in accordance with the contract drawings and specifications or as directed by the Engineer.
3. The Engineer shall direct the Contractor on the type of material allowed in certain sections of the earthwork operations.

C. Structural Fill: Structural fill shall be well graded sand to gravelly sand having the following gradation:

<u>U.S. Sieve Size</u>	<u>Percent Passing by Weight</u>
1 inch	100
No. 4	75-100
No. 40	15-80
No. 100	0-30
No. 200	0-10

D. Class I Soils: Manufactured angular, granular material, 1/4 to 1-1/2 inches (6 to 40 mm) in size, including materials having significance such as crushed stone or rock, broken coral, crushed slag, cinders, or crushed shells. Sieve analysis for crushed stone is given below separately.

1. Class I Soils are not defined in ASTM D2487.
2. Crushed Stone: Crushed stone shall consist of clean mineral aggregate free from clay, loam, or organic matter, conforming with ASTM C33 stone size No. 89 and with particle size limits as follows:

<u>U.S. Sieve Size</u>	<u>Percent Passing by Weight</u>
1/2	100
3/8	90-100
No. 4	20-55
No. 8	5-30
No. 16	0-10
No. 50	0-5

E. Class II Soils: In accordance with ASTM D2487, less than 5 percent (5%) pass No. 200 sieve.

1. GW: Well-graded gravels and gravel-sand mixtures, little or no fines. 50 percent (50%) or more retained on No. 4 sieve. More than 95 percent retained on No. 200 sieve. Clean.
2. GP: Poorly graded gravels and gravel-sand mixtures, little or no fines. 50 percent (50%) or more retained on No. 4 sieve. More than 95 percent retained on No. 200 sieve. Clean.
3. SW: Well-graded sands and gravelly sands, little or no fines. More than 50 percent (50%) passes No. 4 sieve. More than 95 percent retained on No. 200 sieve. Clean.
4. SP: Poorly graded sands and gravelly sands, little or no fines. More than 50 percent (50%) passes No. 4 sieve. More than 95 percent retained on No. 200 sieve. Clean.

F. Coarse Sand: Sand shall consist of clean mineral aggregate with particle size limits as follows:

<u>U.S. Sieve Size</u>	<u>Percent Passing by Weight</u>
No. 10	100
No. 20	0-30
No. 40	0-5

G. Other Material: All other material, not specifically described, but required for proper completion of the Work shall be selected by the Contractor and approved by the Engineer.

PART 3 – EXECUTION

3.01 PREPARATION

A. Clearing and Grubbing:

1. Clearing and grubbing shall be performed in accordance with Section 02110.
2. Strip and disposed of topsoil on-site, unless otherwise directed to stockpile the material by the Engineer.

3.02 PROTECTION

A. Sheeting and Bracing:

1. Furnish, put in place, and maintain sheeting and bracing as required to support the sides of excavations, to prevent movement which could, in any way, diminish the width of the excavation below that necessary for proper construction, and to protect adjacent structures, and to protect workers from hazardous conditions or other damage. Such support shall consist of braced steel sheet piling, braced wood lagging and soldier beams or other approved methods. If the Owner is of the opinion that sufficient or proper supports have not been provided, he may order additional supports be installed at the expense of the Contractor, and in compliance with such order shall not relieve or release the Contractor from his responsibility for the sufficiency of such supports. Care shall be taken to prevent voids beside the sheeting, but if voids are formed, they shall be immediately filled and compacted. Where soil cannot be properly compacted to fill a void, lean concrete shall be used as backfill, at no additional expense to the Owner.
2. The Contractor shall construct sheeting outside the neat lines of the foundation unless deemed otherwise for his method of operation. Sheeting shall be plumb and securely braced and tied in position. Sheeting and bracing shall withstand all pressure to which the structure or trench will be subjected. The Contractor shall correct any deformation, at his own expense, so as to provide the necessary clearances and dimensions.
3. Where sheeting and bracing is required to support the sides of excavations for structures, the Contractor shall engage a Professional Geotechnical Engineer, registered in the State of Florida, to design the sheeting and bracing. The sheeting and bracing installed shall conform with the design, and certification of this shall be provided by the Professional Geotechnical Engineer.
4. The installation of sheeting, particularly by driving or vibrating, may cause distress to existing structures. The Contractor shall evaluate the potential for such distress and, if necessary, take all precautions to prevent distress of existing structures because of sheeting installation.
5. The Contractor shall leave in place to be embedded in the backfill, all sheeting and bracing not shown on the Drawings but which the Owner directs him, in writing, to leave in place at any time during the progress of the work for the purpose of preventing injury to structures, utilities, or property, whether public or private. The Owner may direct that timber used for sheeting and bracing be cut off at any specified elevation.
6. All sheeting and bracing not left in place shall be carefully removed in such manner as not to endanger the construction, or other structures, utilities, or property. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted for that purpose, or otherwise directed by the Owner.

7. The right of the Owner to order sheeting and bracing left in place shall not be construed as creating any obligation on his part to issue such orders, and his failure to exercise his right to do so shall not relieve the Contractor from liability for damages to persons or property occurring from or upon the work occasioned by negligence or otherwise, growing out of a failure on the part of the Contractor to leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.
8. No wood sheeting is to be withdrawn if driven below mid-diameter of any pipe, and under no circumstances shall any wood sheeting be cut off at a level lower than 1 foot above the top of any pipe.

B. Pumping and Drainage:

1. The Contractor shall, at all times during construction, provide and maintain proper equipment and facilities to remove all water entering excavations, and shall keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the fills, structures or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural levels as stipulated in Section 02140. The Contractor shall engage a Professional Geotechnical Engineer, registered in the State of Florida, to design the dewatering systems for all structures. The Contractor shall submit to the Engineer for review a plan for dewatering systems prior to commencing work. The installed dewatering system shall be in conformity with the overall construction plan, and certification of this shall be provided by the Professional Geotechnical Engineer. The Professional Geotechnical Engineer shall be required to monitor the performance of the dewatering systems during the progress of the work and require such modifications as may be required to assure that the systems are performing satisfactorily.
2. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at the bottom of the excavation and to preserve the integrity of adjacent structures. Well or sump installations shall be constructed with proper sand filters to prevent intermixing of finer grained soil from the surrounding ground.
3. Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and pumped from the excavation to maintain a bottom free from standing water.
4. The Contractor shall take all additional precautions to prevent buoyant uplift of any structure during construction.
5. The conveying of dewatered liquids in open ditches or trenches will not be allowed. Permission to use any storm sewers, or drains, for water disposal purposes shall be obtained from the authority having jurisdiction. Any requirements and costs for such use shall be the responsibility of the Contractor. The Contractor shall not cause flooding by overloading or blocking up the flow in the drainage facilities, and he shall leave the facilities unrestricted and as clean as originally found. Any damage to facilities shall be repaired or restored as directed by the Owner or the authority having jurisdiction, at no cost to the Owner.
6. Flotation shall be prevented by the Contractor by maintaining a positive and continuous operation of the dewatering system. The Contractor shall be fully responsible and liable for all damages which may result from failure of this system.
7. Removal of dewatering equipment shall be accomplished after the system is no longer required; the material and equipment constituting the system, shall be removed by the Contractor.

8. The Contractor shall take all necessary precautions to preclude the accidental discharge of fuel, oil, etc. in order to prevent adverse effects on groundwater quality.

C. Utility Protection and Changes – Where public or private utilities are encountered:

1. Maintain, support, and save all public utilities from damage.
2. Allow reasonable time and space for owners of private utilities to cooperate in maintaining their facilities.
3. Excavate test pits:
 - a. A minimum of two (2) working days or 500 feet in advance of construction to determine precise location of obstructions and existing utilities, which may affect alignment of the Work.
 - b. Size: 3 feet square to the depth required, unless larger pit is required to adequately investigate utility locations.
 - c. Prior to excavation, notify the Engineer and affected utility owners.
 - d. Test pits shall include excavation, temporary sheeting, dewatering, backfilling, compaction, and pavement replacement.

3.03 EXCAVATION

A. Excavation for Structures and Utilities:

1. Excavation work shall be performed in a safe and proper manner with appropriate precautions being taken against all hazards. Excavations shall provide adequate working space and clearances for the work to be performed therein and for installation and removal of concrete forms. In no case shall excavation faces be undercut for extended footings.
2. Excavation shall be made to such dimensions as will give suitable room for bracing and supporting, for pumping and draining, for installing the pipelines, and for all other work required.
 - a. Excavation for precast or prefabricated structures shall be carried to an elevation two (2) feet lower than the proposed outside bottom of the structure to provide space for the backfill material.
 - b. Excavation for structures constructed or cast-in-place in dewatered or dry excavations shall be carried down to the 2-feet below the bottom of the structure where dewatering methods are such that a dry evacuation bottom is exposed and the naturally occurring material at this elevation leveled and left ready to receive construction. Material disturbed below the founding elevation in dewatered excavations shall be replaced with Class B concrete.
3. Immediately document the location, elevation, size, material type and function of all new subsurface installations, and utilities encountered during the course of construction.
4. Excavation equipment operators and other concerned parties shall be familiar with subsurface obstructions as shown on the Drawings and should anticipate the encounter of unknown obstructions during the course of the Work.
5. Encounters with subsurface obstructions shall be hand excavated.

6. Excavation and dewatering shall be accomplished by methods which preserve the undisturbed state of subgrade soils. Subgrade soils which become soft, loose, "quick" or otherwise unsatisfactory for support of structures as a result of inadequate dewatering or other construction methods, shall be removed and replaced by crushed stone as required by the Engineer at the Contractor's expense.
7. The bottom of excavations shall be rendered firm and dry before placing any structure or pipe. Excavated material not suitable for backfill shall be removed from the site and disposed of by the Contractor in a legal manner. The bedding schedule for pipes shall be as shown on the drawings.
8. Excavated material shall be stockpiled in such a manner as to prevent nuisance conditions. Surface drainage shall not be hindered.
9. All structure and pipe locations and elevations, as required, herein must be permanently documented by the Contractor on the Record Drawings prior to the Engineer's approval of the Application for Payment for that Work.

3.04 DRAINAGE

- A. The Contractor shall at all times during construction, provide and maintain proper equipment and facilities to remove promptly and dispose of properly all water entering excavations, and keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition. The dewatering method used shall prevent disturbance of earth below grade.
- B. All water pumped or drained from the excavated area shall be disposed of in a suitable manner without undue interference with other work, without damage to surrounding property, and in accordance with pertinent rules and regulations.
- C. No construction, including pipe laying, shall be allowed in water. Groundwater shall be maintained at least 24 inches below excavation. No water shall be allowed to come into contact with masonry or concrete within 24 hours after being placed. The Contractor shall constantly guard against damage due to water and take full responsibility for all damage resulting from his failure to do so.
- D. The Contractor will be required, at his expense, to excavate below grade and refill with approved fill material if the Owner determines that adequate drainage has not been provided.

3.05 UNDERCUT

- A. If the bottom of any excavation is below that shown on the Drawings or specified because of Contractor error, convenience, or unsuitable subgrade due the Contractor's excavation methods, he shall refill to normal grade with fill at his own cost. Fill material and compaction method shall be as directed by the Engineer.

3.06 STABILIZATION

- A. Subgrades for concrete structures and trench bottoms shall be firm dense, and thoroughly compacted and consolidated; shall be free from mud and muck; and shall be sufficiently stable to remain firm and intact.
- B. Subgrades for concrete structures or trench bottoms which are otherwise solid, but which becomes mucky on top due to construction operations, shall be reinforced with one or more layers of crushed rock or gravel. Not more than ½ inch depth of mud or muck shall be allowed to remain on stabilized trench bottoms when the pipe bedding material is placed thereon. The finished elevation of stabilized subgrades for concrete structures shall not be above subgrade elevations shown on the Drawings.
- C. All stabilization work shall be performed by and at the expense of the Contractor.

3.07 FILL AND COMPACTION

A. Materials:

1. To the maximum extent available, excess earth obtained from structure and trench excavation shall be used for the construction of fills and embankments.
2. Materials used as backfill shall be free from rocks or stones larger than 2 inches in their greatest dimension; brush, stumps, logs, roots, debris, and organic or other deleterious materials; and must be acceptable to the Engineer.
3. Backfilling and construction of fills and embankments during freezing weather shall not be done except by permission of the Engineer. No backfill, fill, or embankment materials shall be installed on frozen surfaces, nor shall frozen materials be in any backfill, fill or embankment.

B. Placement and Compaction:

1. Backfill materials shall be placed in approximately horizontal layers not to exceed 8 inches in uncompacted thickness. Material deposited in piles or windrows by excavating and hauling equipment shall be spread and leveled before compaction.
2. Each layer of material being compacted shall have the best practicable uniform moisture content to ensure satisfactory compaction. The Contractor will be required to add water and harrow, disc, blade, or otherwise work the material in each layer to ensure uniform moisture content and adequate compaction. Each layer shall be thoroughly compacted by rolling or other method acceptable to the Engineer to 95 percent of relative density at optimum moisture content as determined by Modified Proctor Method, ASTM D1557, (latest).
3. Whenever a trench passes through a backfill or embankment, material shall be placed and compacted to an elevation 12 inches above the top of the pipe before the trench is excavated.

C. Compact and backfill excavations and construct embankments for structures according to the drawings.

D. Pipe shall be laid in open trenches unless otherwise indicated on the Drawings or elsewhere in the Contract Documents.

E. Excavations shall be backfilled to the original grade or as indicated on the Drawings. Deviation from this grade because of settling shall be corrected. Backfill operation shall be performed to comply with all rules and regulations and in such a manner that it does not create a nuisance or safety hazard.

F. Embankments shall be constructed true to lines, grades and cross sections shown on the plans or ordered by the Owner. Embankments shall be placed in successive layers of not more than 8 inches in thickness, loose measure, for the full width of the embankment. As far as practicable, traffic over the work during the construction phase shall be distributed so as to cover the maximum surface area of each layer.

G. If the Contractor requests approval to backfill material utilizing lifts and/or methods other than those specified herein, such request shall be in writing to the Engineer. Approval will be considered only after the Contractor has performed tests, at the Contractor's expense, to identify the material used and density achieved throughout the backfill area utilizing the method of backfill requested. The Engineer's approval will be in writing.

H. Foundation Preparation:

1. The existing ground beneath proposed tankage, building foundations and equipment base slabs and slabs on grade shall be removed and the area proof-rolled. Proof-rolling should consist of at least 10 passes of a self-propelled vibrator compactor capable of delivering a minimum impact force of 30,000 to 35,000 pounds per drum to the soils. Each pass should overlap the preceding

pass by 30 percent (30%) to insure complete coverage. Backfilled areas shall be compacted in 8-inch layers to a density of not less than 95 percent (95%) of Modified Proctor Dry Density as determined by ASTM D1557 (latest) for a depth of not less than 2-feet below the bottom of the foundations or concrete slabs. Any unsuitable foundation material shall be removed and replaced with suitable material.

2. Slabs On Grade: Subgrades for concrete slabs shall be removed, backfilled, and compacted to the required grade. The top 2-feet of concrete slab subgrade in cut sections and all fill material shall be compacted in 8-inch layers to a density of not less than 95 percent of Modified Proctor Dry Density as determined by ASTM D1557, (latest).

3.08 TRENCH EXCAVATION (SEE DRAWINGS FOR DETAIL)

- A. The Contractor shall not open more trench in advance of pipe laying than is necessary to expedite the work. Four hundred (400) feet shall be the maximum length of open trench on any line under construction. All trench excavation shall be open cut from the surface.

1. Alignment, Grade, and Minimum Cover: The alignment and grade or elevation of each pipeline shall be fixed and determined from offset stakes. Vertical and horizontal alignment of pipes, and the maximum joint deflection used in connection therewith shall be in conformity with requirements of the section covering installation of pipe.
2. Where pipe grades or elevations are not definitely fixed by the contract drawings, trenches shall be excavated to a depth sufficient to provide a minimum depth of backfill cover over the top of the pipe of 36 inches. Greater pipe cover depths may be necessary on vertical curves or to provide necessary clearance beneath existing pipe conduits, drains, drainage structures, or other obstructions encountered at normal pipe grades. Measurement of pipe cover depth shall be made vertically from the outside top of pipe to finished ground or pavement surface elevation.

B. Limiting Trench Widths:

1. Trenches shall be excavated to a width which will provide adequate working space and sidewall clearances for proper pipe installation, jointing, and embedment. However, minimum permissible sidewall clearances between the installed pipe and each trench wall, expressed in inches, shall be as follows:

<u>Pipe Size</u>	<u>Minimum Sidewall Clearance</u>
60	24
54	21
48	19
36 or smaller	12

2. Stipulated minimum sidewall clearances are not minimum average clearances but are minimum clear distances which will be required.
3. Cutting trench banks on slopes to reduce earth load to prevent sliding and caving will be permitted only in areas where the increased trench width will not interface with surface features or encroach on right-of-way limits. Slopes shall not extend lower than one foot above the top of the pipe.

C. Mechanical Excavation:

1. The use of mechanical equipment will not be permitted in locations where its operation would cause damage to trees, buildings, culverts, and other existing property, utilities, or structures above or below ground. In all such locations, hand excavating methods shall be used.

2. Mechanical equipment used for trench excavation shall be of the type, design, and construction, and shall be so operated, that the rough trench excavation bottom elevation can be controlled, that uniform trench widths and vertical sidewalls are obtained at least from an elevation one foot above the top of the installed pipe to the bottom of the trench, and that trench alignment is such that pipe, when accurately laid to specified alignment, will be centered in the trench with adequate clearance between the pipe and sidewalls of the trench. Undercutting the trench sidewall to obtain clearance will not be permitted.

D. Pavement Cutting:

1. Cuts in concrete pavement, asphalt pavement, and asphalt base pavements shall be no larger than necessary to provide adequate working space for proper installation of pipe and appurtenances. Cutting shall be started with an asphalt or concrete saw in a manner which will provide a clean groove for the full depth of pavement along each side of the trench and along the perimeter of cuts for structures.
2. Asphalt pavement and asphalt base pavement over trenches excavated for pipelines shall be removed so that a shoulder not less than 6 inches in width at any point is left between the cut edge of the pavement and the top edge of the trench. Trench width at the bottom shall not be greater than at the top and no undercutting will be permitted. Pavement cuts shall be made to and between straight or accurately marked curved lines which, unless otherwise required, shall be parallel to the centerline of the trench.
3. Pavement removed for connections to existing lines or structures shall not be greater than necessary for the installation as determined by the Engineer.

E. Artificial Foundations in Trenches: Whenever so ordered by the Engineer, the Contractor shall excavate to such depth below grade as the Engineer may direct and the trench bottom shall be brought to grade with such material as the Engineer may order installed. All piling, concrete, or other foundations made necessary by unstable soil shall be installed as directed by the Engineer. Compensation for extra excavation and piling, concrete, or other foundations, except where provided by contract unit prices, shall be made in accordance with the contract provisions for extra work.

F. Bell Holes: Bell holes shall provide adequate clearance for tools and methods used in installing pipe. No part of any bell or coupling shall be in contact with the trench bottom, trench walls, or granular embedment when the pipe is jointed.

3.09 TESTS

A. Testing is specified in Section 01410: Testing and Testing Laboratory Services.

3.10 DRAINAGE

A. Trenches across roadways, driveways, walks, or other trafficways adjacent to drainage ditches or water courses shall not be backfilled prior to completion of backfilling the trench on the upstream side of the trafficway to prevent impounding water after the pipe has been laid. Bridges and other temporary structures required to maintain traffic across such unfilled trenches shall be constructed and maintained by the Contractor. Backfilling shall be done so water will not accumulate in unfilled or partially filled trenches. All material deposited in roadway ditches or other water courses crossed by the line of trench shall be removed immediately after backfilling is completed and the original sections, grades, and contours of ditches or water courses shall be restored. Surface drainage shall not be obstructed longer than necessary.

3.11 FINAL GRADING

- A. After other outside work has been finished, and backfilling completed and settled, all areas on the site of the Work, which are to be graded, shall be brought to grade with the tolerance of +/- 0.1 feet at the indicated elevations, slopes, and contours where seeding or sodding is not required or, where sodding is required, within 3 inches of finished grade. Use of graders or other power equipment will be permitted for final grading and dressing of slopes, provided the result is uniform and equivalent to hand work. All surfaces shall be graded to secure effective drainage. Unless otherwise shown, a slope of at least one percent shall be provided.
- B. After grading and where seeding is required, topsoil shall be evenly spread to a minimum depth of 6 inches. Topsoil shall be from an Engineer approved source and shall be clear of trash, debris and surface vegetation more than 6 inches in height.
- C. Grading and surfacing shall be complete to the satisfaction of the Engineer.

3.12 EXCESS EXCAVATED MATERIALS

- A. Insofar as needed, suitable excavated materials shall be used in fills and embankments shown on the Drawings. All suitable excess excavated material shall be placed at an on-site stockpile area as directed by the Owner.
- B. The Contractor shall segregate different types of excavated materials (i.e. sands, clayey sands) as possible in the stockpile area. All unsuitable materials shall be disposed of by the Contractor offsite in a legal manner.
- C. The Contractor shall slope and compact the stockpile with a light roller type vehicle to maintain stability.
- D. The Contractor shall maintain proper soil and erosion control measures.

3.13 SETTLEMENT

- A. The Contractor shall be responsible for all settlement of backfill, fills, and embankments which may occur within the correction period stipulated in the General Conditions.
- B. The Contractor shall make, or cause to be made, all repairs or replacements made necessary by settlement within 30 days after notice from the Engineer or Owner.

END OF SECTION

SECTION 02645

HYDRANT ASSEMBLIES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: Furnish and deliver fire hydrants of the type(s) and size(s) as specified herein.
- B. Related Work Specified Elsewhere:
 - 1. Gate Valves: Section 15101

1.02 QUALITY ASSURANCE

- A. Hydrants shall conform to AWWA C502 and all hydrants shall be from one (1) manufacturer.
- B. Acceptable hydrant manufacturers and models are:
 - 1. American-Darling B-84-B
 - 2. Mueller Centurion
 - 3. Clow Medallion
 - 4. Kennedy KDI-D

1.03 SUBMITTALS

- A. The Contractor shall submit in conformance with Section 01340: Shop Drawings and Samples, for review by the Engineer, complete sets of detailed and dimensioned working shop drawings.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Fire Hydrants:
 - 1. Dry barrel compression type with break-away upper section conforming to AWWA C502.
 - 2. Connections:
 - a. Hose connections:
 - (1) Two (2) 2 ½ inch hose connection.
 - (2) One (1) 4 ½ inch pumper nozzle connection.
 - (3) Threads:
 - (a) 2 ½ inch: 60 degree V threads, 7 ½ threads to the inch, external outside diameter (OD) 3 1/16 inch National Standard.
 - (b) 4 ½ inch: Four (4) threads to the inch, external OD 5 ¾ inch , National Standard.
 - b. Inlet connection:
 - (1) 6 inch mechanical joint bottom inlet.

(2) Main valve openings shall be 5 ¼ inch.

3. Pressure rating:

- a. Working pressure: 150 psi

4. Working parts:

- a. Bronze and open counterclockwise.
- b. Removable from top of hydrant while in place.

5. Design:

- a. Hose caps chained to hydrant barrel fitted with nuts similar to hydrant operating nut.
- b. Barrel length sufficient for 6 foot pipe burial.
- c. Stand pipe breaking rind or breakable sections.
- d. Constructed in at least two (2) sections bolted together.
- e. Renewable O-ring stem seals.

6. Coating:

- a. Hydrant barrels shall receive one coat of primer.
- b. The hydrant shall be factory painted yellow. The top of the hydrant shall be painted as follows:

(1) Flows of less than five hundred (500) gallons per minute (gpm) – Red.

(2) Flows of five hundred (500) to one thousand (1,000) gpm – Orange.

(3) Flows of one thousand (1,000) to fifteen hundred (1,500) gpm – Green.

(4) Flow of fifteen hundred (1,500) gpm or more – Blue.

PART 3 – EXECUTION

3.01 PREPARATION

A. Site specific requirements as per City of Leesburg.

- 1. Fire hydrant shall be supplied without a weep hole, or with a permanently plugged weep hole.
- 2. A shear pad may be recessed up to 4 inches below finished grade and then sod the recessed section. 6 inch minimum clearance from the shear pad to the bottom bolts.
- 3. Hydrants shall not be installed in the flow line of any ditch or swale.
- 4. 7.5 feet shall remain clear of obstructions in front of the hydrant and 4 feet to the rear shall remain clear of obstructions (including landscaping).
- 5. No hydrant shall be installed more than 8 feet or less than 3 feet from an improved surface.

END OF SECTION

SECTION 02665

HORIZONTAL DIRECTIONAL DRILLING OF PRESSURE MAINS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: Furnish and install underground utilities using the horizontal directional drilling (HDD) method of installation, also commonly referred to as directional boring or guided horizontal boring, for pressure pipe. This Work shall include all piping services, equipment, materials, and labor for the complete and proper installation testing, restoration of underground utilities, and environmental protection and restoration.

1.02 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Directional drilling Contractor or Subcontractor shall have a minimum of 4-years of experience constructing water, wastewater, or reclaimed water experience to include pipelines of the same or larger diameter and the same or greater lengths. All pipe and appurtenances of similar type and material shall be furnished by a single manufacturer.
 - 2. The Contractor's operations shall be in conformance with the Directional Crossing Contractor Association (DCCA) published guidelines (latest edition) and pipe manufacturer's guidelines and recommendations.

1.03 TESTING REQUIREMENTS

- A. Submittals shall be submitted to the Owner for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01340: Shop Drawings, Work Drawings, and Samples.
 - 1. Work Plan
 - 2. Pipe
 - 3. Couplings
 - 4. HDPE mechanical joint adapters
 - 5. Training and experience of directional boring machine operator
 - 6. Directional drilling equipment Specifications including calibration records
- B. Prior to beginning Work, the Contractor must submit a work plan to the Owner detailing the procedure and schedule to be used to execute the Project. The Work plan should include the following:
 - 1. A description of all equipment to be used
 - 2. Down-hole tools
 - 3. A list of personnel and their qualifications and experience
 - 4. List of Subcontractors
 - 5. A schedule of Work activity
 - 6. A safety plan and traffic control plan (if applicable)

7. An environmental protection plan
8. Contingency plans for possible problem

C. Equipment:

1. The Contractor will submit specifications on directional drilling equipment to be used to ensure the equipment will be adequate to complete the Project. Equipment shall include but not be limited to the following:
 - a. Drilling rig
 - b. Mud system
 - c. Mud motors (if applicable)
 - d. Down-hole tools
 - e. Guidance system
 - f. Rig safety systems

PART 2 – PRODUCTS

2.01 GENERAL

- A. Pipe material supplied under this section shall be high performance, high molecular weight, high density polyethylene pipe (HDPE), specifically PE 4710.
- B. The direction drilling equipment shall consist of the following:
 1. A directional drilling rig of sufficient capacity to perform the bore and pullback operations.
 2. A drilling fluid mixing, delivery, and recovery system of sufficient capacity to complete the crossing.
 3. A drilling fluid recycling system to remove solids from the drilling fluid so the fluid can be reused.
 4. A magnetic guidance system to accurately guide boring operations.
 5. A vacuum truck of sufficient capacity to handle the drilling fluid volume
 6. Trained and competent personnel shall operate the system.
- C. All equipment shall be in good, safe operating condition with sufficient supplied, materials, and spare parts on hand to maintain the system in proper working order.

2.02 DRILLING SYSTEM

- A. The directional drilling machine shall consist of a hydraulically powered system to rotate, push, and pull hollow drill pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The machine shall be anchored to the ground to withstand the pulling, pushing, and rotating pressure required to complete the crossing. The hydraulic power system shall be self-contained with sufficient pressure and volume to power drilling operations. Hydraulic system shall be free of leaks. Rig shall have a system to monitor and record maximum pullback pressure during pullback operations. The rig shall be grounded during drilling and pullback operations. There shall be a system to detect electrical current from the drilling string and an audible alarm that automatically sounds when an electrical current is detected.

2.03 PIPE

- A. Pipe for HDD shall be fusible PVC or HDPE pipe with outside diameters in accordance with AWWA C900 (C905) or C906, respectively. The dimension ratio shall be verified by the Contractor based on the pipe, joint, and material pull strength required for the directional drilling.

B. PVC Pipe

1. PVC restrained joint pipe shall have maximum dimension ratios equal to the following table:

<u>Type of Pipe System</u>	<u>Maximum Dimension Ratio</u>
Wastewater	18
Reclaimed Water	18
Water	18

2. PVC pipe shall meet the requirements of AWWA C900. The pipe shall be joined using separate couplings that have beveled edges, built-in sealing gaskets and restraining grooves or steel ring-and-pin gasketed joints. The restraining splines shall be square and made from Nylon 101. Pipe and couplings shall be Underwriters Laboratory Solutions and Factory Mutual Global approved.
3. Installation Curvature: The pipeline curvature shall not have a radius less than as show in following table:

<u>Pipe Diameter (inches)</u>	<u>Minimum Radius of Curvature (feet)</u>	<u>Offset per 20-ft Length (inches)</u>	<u>Deflection per 20-ft Length (degrees)</u>
4	133	17.25	8.6
6	200	12.00	5.7
8	266	9.00	4.3
10	333	6.75	3.5
12	400	6.00	2.9
16	532	4.50	1.5

C. HDPE Pipe

1. HDPE pipe and related fitting shall be made with prime virgin resins exhibiting a minimum cell classification as defined in ASTM D3350 and meeting the PE 4710 code designation with maximum dimension ratios equal to the following:

<u>Type of Pipe System</u>	<u>Maximum Dimension Ratio</u>
Wastewater	11
Reclaimed Water	11
Water	11

2. HDPE pipe 4-inch and larger nominal diameter shall be joined be means of zero leak rate butt (thermal heat) fusion welds and/or approved flanged joints. Joints shall provide axial pullout resistance. Pipe shall meet the requirements of ANSI/AWWA C906 and have an outside diameter dimension of ductile iron pipe. Flanged joints shall not be used below finished grade for HDD applications.
3. HDPE pipe shall have been continuously marked by the manufacturer with permanent printing indicating, at a minimum, the following:
- Nominal size (inches)
 - Dimension ratio (DR)
 - Pressure rating (psi)

- d. Trade name
 - e. Material classification (PE 4710)
 - f. Plant, extruder, and operator codes
 - g. Resin supplier code
 - h. Date produced
 - i. HDPE pipe used for potable water mains shall bear the NSF Seal of Approval.
4. HDPE pipe shall be black in color with permanently colored stripes extruded into the pipe length or shall be one (1) solid color, per the applicable service such as the following:

<u>Pipe Use</u>	<u>Color Coding</u>
Potable Water	Blue
Wastewater	Green
Reclaimed Water	Purple

5. Installation Curvature: The pipeline curvature shall not have a radius less than as shown in the following table:

<u>Pipe Diameter (inches)</u>	<u>Minimum Radius of Curvature (feet)</u>	<u>Offset per 20-ft Length (inches)</u>
4	23	9.3
6	34	6.1
8	44	4.6
10	56	3.5
12	67	3.0
16	88	2.3

2.04 LOCATING WIRE

- A. Locating wire shall be 10-gauge continuous single strand solid core copper wire with non-metallic insulation.
- B. Color-coding shall be similar to pipeline identification colors.
- C. A minimum of 3 locating wires shall be attached with nylon wire ties at different radial locations around the pipe to ensure continuity in at least 1 wire subsequent to installation. Contractor shall be required to provide as many wires as necessary to maintain continuity throughout the length of the directional bore. Failure of continuous continuity in the locating wire shall result in abandonment and reinstallation of the directional drill, at the discretion of the City.

2.05 DRILLING FLUIDS

- A. Drilling fluids shall consist of a mixture of potable water and gel-forming colloidal material, such as bentonite or a polymer surfactant mixture producing a slurry of custard-like consistency.

PART 3 – EXECUTION

3.01 COMPACTION REQUIREMENTS

- A. Responsible representatives of the Contractor and Subcontractor(s) shall be present at all times during directional drilling operations. A responsible representative as specified herein is defined as a person

experienced in the type of work being performed and who has the authority to represent the Contractor in a routine decision-making capacity concerning the manner and method of carrying out the Work.

- B. The Contractor and Subcontractor(s) shall have sufficient number of competent workers on the Project at all times to ensure the utility placement is made in a timely, satisfactory manner. Adequate personnel for carrying out all phases of the directional drilling operation (where applicable: tunneling system operators, operator for removing spoil material, and laborers as necessary for various related tasks) must be on the job site at the beginning of Work. A competent and experienced supervisor representing the Contractor or Subcontractor, that is thoroughly familiar with the equipment and type of work to be performed, must be in direct charge and control of the operation at all times. In all cases, the supervisor must be continually present at the project site during the directional drilling operation.

3.02 WORK PLAN

- A. Work plan should be comprehensive, realistic, and based on actual working conditions for this particular Project. Plan should document the requirements to complete the Project.
 - 1. Calibration records for guidance equipment shall be included. Specifications for any drilling fluid additives the Contractor intends to use, or might use, shall be submitted.

3.03 COORDINATION OF THE WORK

- A. The Contractor shall notify the County at least 3-days in advance of starting Work. In addition, the actual crossing operation shall not begin until the County is present at the project site and agrees that proper preparations for the crossing have been made. The County's approval for beginning the crossing shall in no way relieve the Contractor from the ultimate responsibility for the completion of the Work.
- B. The Contractor and the County shall select a mutually convenient time for the crossing operation to begin in order to avoid schedule conflicts.

3.04 PROCEDURE

- A. The installation of appropriate safety and warning devices in accordance with the "FDOT Manual on Traffic Control and Safe Practices" shall be completed prior to beginning Work.

3.05 INSTALLATION

- A. Erosion and sedimentation control measures and on-site containers shall be installed to prevent drilling mud from spilling out entry and/or exit pits. Drilling mud shall be disposed of off-site in accordance with local, state, and federal requirements and/or permit conditions.
 - 1. No other chemicals or polymer surfactant shall be used in the drilling fluid without written consent of the County and after a determination is made that the chemicals to be added are not harmful or corrosive to the facility and are environmentally safe.
- B. Pilot Hole: Pilot hole shall be drilled on bore path with no deviations greater than 2% of depth over a length of 100-feet. In the event the pilot does deviate from bore path more than 2% of depth in 100-feet, the Contractor shall notify the County. The County may require the Contractor to pullback and re-drill from the location along bore path before the deviation.
- C. Reaming: Upon successful completion of pilot hole, the Contractor will ream borehole to a minimum of 25% greater than outside diameter of pipe using the appropriate tools. Contractor will not attempt to ream at one time more than the drilling equipment and mud system are designed to safely handle.
- D. Pullback: After successfully reaming borehole to the required diameter, Contractor shall put the pipe through the borehole. In front of the pipe shall be a swivel and barrel reamer to compact bore hole walls.

Once pullback operations have commenced, operations must continue without interruption until pipe is completely pulled into borehole. During pullback operations, the Contractor shall not apply more than the maximum safe pipe pull pressure at any time. A break away head rated at the maximum safe pull pressure shall be utilized.

- E. As-built variance from the designed bore path shall not exceed \pm (plus or minus) 1-foot in the vertical plane and \pm 2-feet in the horizontal plane. The Contractor shall submit any proposed deviations from the design bore path with Shop Drawings.
- F. The pipe entry area shall be graded to provide support for the pipe to allow free movement into the borehole. The pipe shall be guided in the borehole to avoid deformation of, or damage to, the pipe.
- G. If unexpected subsurface conditions are encountered during the bore, the procedure shall be stopped. The installation shall not continue until the County has been consulted.
- H. The pipe shall be pulled back through the borehole using the wet insertion construction technique. The pipe shall be installed full of water.
- I. The pipe shall be installed in a manner that does not cause upheaval, settlement, cracking, movement or distortion of surface features.
- J. A boring log shall be kept with horizontal and vertical location every 10-feet. The horizontal location of the bore shall be marked in the field during the bore. The Surveyor shall locate these marks and include this information with the bore depths in the Record Drawings. The Surveyor may make a note on the drawing page containing the directional drill and provide an exception for the directional drill only, as the directional drill route cannot be uncovered and physically located.
- K. The pipe shall be installed at a depth of no more than 15 -feet below pavement, as a measured from the top of pipe.

3.06 FIELD TESTING

A. PVC Pipe

- 1. Perform hydrostatic testing for leakage following installation in accordance with the applicable test sections.

B. HDPE Pipe

- 1. Perform hydrostatic testing for leakage following installation of the directional drill.
 - a. Test Duration: The total test time including initial pressurization, initial expansion, and time at test pressure must not exceed 8-hours. If the test is not completed due to leakage, equipment failure, etc., the test section shall be depressurized and allowed to "relax" for a minimum of 8-hours before it is brought back up to test pressure. The test procedure consists of the initial expansion phase and leakage test phase.
 - b. Initial Expansion Phase: During the initial expansion phase, the test section is pressurized to the test pressure and enough make-up liquid is added each hour for 3-hours to return to test pressure.
 - c. Leakage Test Phase: The leakage test phase follows immediately and shall be either 2 or 3-hours in duration. At the end of the time test, the test section shall be returned to test pressure by adding a measured amount of liquid. The amount of make-up liquid added shall not exceed the values provided in the following table plus allowable leakage:

Test Duration (hours)	2	4	6	8	12	16	20	24
	Allowance/100-feet of Pipeline (gallons)							
2	0.11	0.25	0.60	1.00	2.30	3.30	5.50	8.90
3	0.19	0.40	0.90	1.50	3.40	5.50	8.00	13.30
* Applies to test period and not to initial expansion phase.								

C. Pressure Testing:

1. The test pressure for the pipe shall be 150-psi for water and reclaimed water and 100-psi for wastewater.

D. Mandrel Testing:

1. Perform mandrel testing through the entire length of the installed pipe. The mandrel size shall be 90% of the inside diameter of the pipe.

END OF SECTION

SECTION 02822

SOLID SODDING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: The work specified in this Section consists of establishing a stand of grass, within the areas indicated on the Drawings, by furnishing and placing grass sod. Also included are fertilizing, watering and maintenance as required to assure a healthy stand of grass. Work performed in the County and State Right-of-Ways and private property shall be replaced with like sod.

1.02 SUBMITTALS

- A. A certification of sod quality by the producer shall be delivered to the Engineer 10 days prior to use.

PART 2 – PRODUCTS

2.01 GRASS SOD

- A. Grass sod shall be Bahia and shall be well matted with grass roots. The sod shall be taken in rectangles, preferably 12 inch by 24 inch, shall be a minimum 2 inches in thickness and shall be live, fresh and uninjured at the time of planting.
- B. It shall be reasonably free of weeds and other grasses and shall have a soil mat of sufficient thickness adhering firmly to the roots to withstand all necessary handling. The sod shall be planted as soon as possible after being dug and shall be shaded and kept moist until it is planted.

2.02 GRASS SOD

- A. Commercial fertilizer shall comply with the state fertilizer laws.
- B. The numerical designations for fertilizer indicate the minimum percentages (respectively) of (1) total nitrogen, (2) available phosphoric acid and (3) water soluble potash contained in the fertilizer.
- C. The chemical designation of the fertilizer shall be 6 percent (6%) nitrogen, 6 percent (6%) phosphorus, and 6 percent (6%) potash. At least 50 percent (50%) of the nitrogen shall be derived from organic sources. At least 50 percent (50%) of the phosphoric acid shall be from normal super phosphate or an equivalent source which will provide a minimum of two (2) units of sulfur. The amount of sulfur shall be indicated on the quantitative analysis card attached to each bag or other container.

2.03 WATER FOR GRASSING

- A. The water used in the sodding operations shall be obtained as provided for in Section 01500: Temporary Facilities.

PART 3 – EXECUTION

3.01 PREPARATION OF GROUND

- A. The area over which the sod is to be placed shall be scarified or loosened to a depth and then raked smooth and free from debris. Where the soil is sufficiently loose and clean, the Engineer, at his discretion, may authorize the elimination of ground preparation.

3.02 APPLICATION OF FERTILIZER

- A. Before applying fertilizer, the soil pH shall be brought to a range of 6.0 to 7.0.
- B. The fertilizer shall be spread uniformly over the area to be sodded at the rate of 700 pounds per acre, or 16 pounds per 1,000 square feet, by a spreading device capable of uniformly distributing the material at the specified rate. Immediately after spreading, the fertilizer shall be mixed with the soil to a depth of approximately 4 inches.
- C. On steep slopes, where the use of a machine for spreading or mixing is not practicable, the fertilizer shall be spread by hand and raked in and thoroughly mixed with the soil to a depth of approximately 2 inches.

3.03 PLACING SOD

- A. The sod shall be placed on the prepared surface, with edges in close contact and shall be firmly and smoothly embedded by light tamping with appropriate tools.
- B. Where sodding is used in drainage ditches, or on slopes of four (4) to one (1) or greater, the setting of the pieces shall be staggered so as to avoid a continuous seam along the line of low. Along the edges of such staggered areas, the offsets of individual strips shall not exceed 6 inches. In order to prevent erosion caused by vertical edges at the outer limits, the outer pieces of sod shall be tamped so as to produce a feathered edge effect.
- C. On slopes greater than two (2) to one (1), the Contractor shall, if necessary, prevent the sod from sliding by means of wooden pegs driven through the sod blocks into firm earth, at suitable intervals.
- D. Sod which has been cut for more than 72 hours shall not be used unless specifically authorized by the Engineer after his inspection thereof. Sod, which is not planted within 24 hours after cutting, shall be stacked in an approved manner, and maintained and properly moistened. Any pieces of sod which, after placing, show an appearance of extreme dryness shall be removed and replaced by fresh, uninjured pieces.
- E. Sodding shall not be performed when weather and soil conditions are, in the Engineer's opinion, unsuitable for proper results.

3.04 WATERING

- A. The areas on which the sod is to be placed shall contain sufficient moisture, as determined by the Engineer, for optimum results. After being placed, the sod shall be kept in a moist condition to the full depth of the rooting zone for at least 2 weeks. Thereafter, the Contractor shall apply water as needed until the sod roots and starts to grow for a minimum of 60 days (or until final acceptance, whichever is latest).

3.05 MAINTENANCE

- A. The Contractor shall, at his expense, maintain the sodded areas in a satisfactory condition until final acceptance of the project. Such maintenance shall include repairing of any damaged areas and replacing areas in which the establishment of the grass stand does not appear to be developing satisfactorily.
- B. Replanting or repair necessary due to the Contractor's negligence, carelessness or failure to provide routine maintenance shall be at the Contractor's expense.

END OF SECTION

SECTION 02950 HOT-MIX ASPHALTIC CONCRETE PAVING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: Furnish all labor, materials, and equipment necessary to complete all asphaltic concrete paving as shown on the Drawings.
- B. Related Work Described Elsewhere:
 - 1. Earthwork: Section 02220

1.02 QUALITY ASSURANCE

- A. Qualifications of Asphaltic Concrete Producers: Hot mix asphaltic to be furnished by a bulk asphaltic concrete producer regularly engaged for five (5) years in production of hot-mix, hot-laid asphaltic concrete.
- B. Qualifications of Testing Agency: Only recognized commercial testing laboratories with not less than 10 years experience in conducting tests and evaluations of asphaltic concrete materials and design shall be used. Refer to Section 01410.
 - 1. Provide asphaltic concrete testing and inspection service acceptable to Engineer.
 - 2. Include sampling and testing asphaltic concrete materials proposed, and tests and calculations for asphaltic concrete mixtures.
 - 3. Provide field-testing facilities for quality control testing during paving operations.
- C. Requirements of Regulatory Agencies: Comply with applicable requirements of:
 - 1. City of Leesburg Public Works Department.
 - 2. State of Florida Department of Transportation, Standard Specifications for Highway and Bridges, latest edition.
 - 3. Lake County Public Works

1.03 PAVING QUALITY REQUIREMENTS

- A. General: In addition to other specified conditions, comply with following minimum requirements:
 - 1. Testing in place asphaltic concrete sources for compliance with requirements for density, thickness, and surface smoothness.
 - 2. Provide final surface of uniform texture, conforming to required grades and cross sections.
 - 3. Take not less than 4 inch diameter pavement specimens for each completed course, from locations as directed by the Engineer.
 - 4. Repair holes from test specimens as specified for patching defective work.
- B. Density:
 - 1. Compare density of in-place materials against laboratory specimens of same asphaltic concrete mixture, when subjected to 50 blow of standard Marshal hammer in each side of specimen.

2. Minimum acceptable density of in-place coarse material in 98 percent of the recorded laboratory specimen density.
- C. Thickness: In-place compacted thickness will not be acceptable if exceeding following allowable variation from thickness shown on Drawings.
1. Base Coarse: $\pm \frac{1}{2}$ inch
 2. Surface Coarse: $\pm \frac{1}{2}$ inch
- D. Surface Smoothness:
1. Test finished surface of each asphaltic concrete course for smoothness, using a 10-foot straightedge applied parallel to and at right angles of centerline of paved areas.
 2. Check surfaced variability will not be acceptable if exceeding the following:
 - a. Base Coarse: $\frac{1}{4}$ inch in 10 feet
 - b. Surface Coarse: $\frac{3}{16}$ inch in 10 feet
 - c. Crowned Surface:
 - (1) Test crowned surfaces with a crown template, centered and at right angles to the crown.
 - (2) Surfaces will not be acceptable if varying more than $\frac{1}{4}$ inch from the template.

1.04 SUBMITTALS

- A. Samples: Proved samples of proposed materials for laboratory testing and job-mix design.
- B. Test Reports: Submit laboratory reports for following material tests:
1. Coarse and fine aggregates from each material source and each required grading:
 - a. Sieve Analysis: ASTM C 136 (AASHTO 27)
 - b. Unit Weight of Slag: ASTM C 29 (AASHTO 19)
 - c. Soundness: ASTM C 88 (AASHTO 104) for surface coarse aggregates only.
 - d. Sand Equivalent: ASTM D 2419 (AASHTO 176)
 - e. Abrasion of Coarse Aggregate: ASTM C 131 (AASHTO 96), for surface coarse aggregates only.
 2. Asphaltic cement for each penetration grade:
 - a. Penetration: ASTM D 5 (AASHTO 49)
 - b. Viscosity (Kinematic): ASTM D 2170 (AASHTO 201)
 - c. Flash Point: ASTM D 92 (AASHTO 48)
 - d. Ductility: ASTM D 113 (AASHTO 51)
 - e. Solubility: ASTM D 2042 (AASHTO 44)
 - f. Specific Gravity: ASTM D 70 (AASHTO 43)

3. Job mix design mixture for each material or grade:
 - a. Bulk Specific Gravity of coarse aggregate: ASTM C 127 (AASHTO 85)
 - b. Bulk Specific Gravity of fine aggregate: ASTM C 128 (AASHTO 84)
4. Uncompacted asphaltic concrete mix: Maximum Specified Gravity ASTM D 2041 (AASHTO 209)
5. Compacted asphaltic concrete mix:
 - a. Bulk Density: ASTM D 1188 (AASHTO 166)
 - b. Marshall Stability and Flow: ASTM D 6927 (AASHTO 245)
6. Density and voids analysis:
 - a. Provide each series of asphaltic concrete mixture test specimens, in accordance with A. I. MS-2 "Mix Design Methods for Asphaltic Concrete."
 - b. Use Marshall Method of mix design unless otherwise directed or acceptable to the Engineer.
 - c. Report the quantity of absorbed asphaltic cement in pounds of dry aggregate, percent air voids, and percent voids in mineral aggregate.
7. Sampling and testing of asphaltic cement mixture for quality control during paving operations.
 - a. Uncompacted asphaltic concrete mix:
 - (1) Asphaltic Cement Content: ASTM D 2172 (AASHTO 164)
 - (2) Penetration of recovered Asphaltic Cement: ASTM D 5 (AASHTO 49)
 - (3) Ductility of Recovered Asphaltic Cement: ASTM D 113 (AASHTO 51)
 - b. Compacted asphaltic concrete mix:
 - (1) Bulk Density: ASTM D 1188 (AASHTO 166)
 - (2) Marshall stability and flow: ASTM D 6927 (AASHTO 245)
 - c. Perform at least one test for each day's paving.
8. Asphaltic Plant Inspections: ASTM D 290
9. Additional testing:
 - a. Perform as may be required if any of the previous tests indicate insufficient values, or if directed by the Engineer.
 - b. Continue testing until specified values have been attained.
10. Asphaltic Concrete materials not complying with specified requirements will not be permitted in the Work.

1.05 JOB CONDITIONS

A. Weather Limitations:

1. Apply bituminous prime and tack coated only when the ambient temperature in the shade is above 50° F and when the temperature has not been below 35° F for 12 hours immediately prior to application.

2. Do not apply when the base surface is wet or contains an excess of moisture, which would prevent uniform distribution and required penetration.
 3. Construct asphaltic concrete surface coarse only when atmospheric temperature is above 40° F, when the underlying base is dry, and when weather is not rainy.
 4. Asphaltic base coarse may be place when air temperature is not below 30° F and rising, when acceptable to the Engineer.
- B. Grade control: Establish and maintain the required lines and grades, including crown and cross-slope, for each course during construction operations.
- C. Traffic Control:
1. Maintain vehicular and pedestrian traffic during paving operations and as required for other construction activities.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Crushed Aggregate Base Course: Sound, durable particle of crushed stone and screening.
1. Coarse aggregate: Angular particles of uniform density, percentage of wear not to exceed 65 after 500 revolutions as determined by ASTM C 131.
 2. Fine aggregate: Angular particles produced by crushing atone that meets the requirements for wear and soundness specified for coarse aggregate.
 3. Crushed stone shall meet the requirements of FDOT for class A or B stone.
- B. Aggregate for Asphaltic Concrete, General:
1. Sound, angular crushed stone, crushed gravel, or crushed Alan: ASTM D 692.
 2. Sand, stone, or slag screening: ASTM D 1073
 3. Provide aggregate in gradation for various coarse to comply with local highway standards.
- C. Surface Coarse Aggregates:
1. Provide natural sand, unless sand prepared from stone, slag, or gravel or combinations are required to suit local conditions.
- D. Asphaltic Cement: Comply with ASTM D 946 for 85-100 penetration grade.
- E. Prime Coat:
1. Cut back liquid asphaltic
 2. Medium-curing type: ASTM D 2027, grade MC-70.
- F. Tack Coat: Emulsified asphaltic

2.02 ASPHALTIC AGGREGATE MIXTURES

- A. Job-mix criteria:
1. Provide job-mix formulas for each required asphaltic aggregate mixture.

2. Establish a single percentage of aggregate passing each required sieve size, a single percentage of asphaltic cement to be added to aggregate, and a single temperature at which asphaltic concrete is to be produced.
3. Comply with the mix requirements of local governing highway standards.
4. Maintain material quantities within allowable tolerance of the governing standards.

2.03 TRAFFIC AND PARKING MARKING MATERIALS

- A. Traffic and parking lane markings shall be Thermoplastic Traffic Stripes, Section 711, FDOT Standard Specifications for roads and bridges, latest edition.
- B. Sealing primer and the proportions used shall be as recommended by the manufacturer of the thermoplastic compound.
- C. Color:
 1. Driving land dividers: 6 inch white
 2. No parking zone: 4 inch yellow
 3. Parking dividers: 4 inch white

PART 3 – EXECUTION

3.01 SURFACE PREPARATION

- A. Subbase preparation:
 1. The contractor shall remove from the area all organic substance to the depth of 6-in or 8-in, as shown on the Drawings, below the surface of the proposed subgrade. The entire areas shall be plowed and dragged prior to placing a stabilizing additive, if required to meet minimum bearing value.
 2. Subbase shall be compacted to a minimum density of 95 percent of the maximum as determined by the Modified proctor density AASHTO T180 and shall have a minimum bearing value of 60 pounds per square inch.
- B. Base Coarse:
 1. Check subgrade for conformity with elevations and section immediately before placing base material.
 2. Place base material in compacted layer not more than 6 inch thick, unless continuing tests indicate the required results are being obtained with thicker layers.
 3. In no case will more than 8 inches of compacted based be placed in one lift.
 4. Spread, shape, and compact all base material deposited on the subgrade during the same day.
 5. Compact base coarse material to not less than 95 percent of maximum density: ASTM D 1557, Method D (98 percent maximum density: AASHTO T 180).
 6. Test density of compacted base coarse: ASTM D 2167.
 7. Conduct one test for each 250 sq yd of in-place material, but not less than one daily for each layer.

C. Loose and Foreign Material:

1. Remove loose and foreign material from compacted subbase surface immediately before application of paving.
2. Use power brooms or blowers, and hand brooming as required.
3. Do not displace subbase material.

D. Prime Coat:

1. Uniformly apply at rate 0.20 to 0.5 gal/sq yd over compacted and cleaned subbase surface.
2. Apply enough material to penetrate and seal, but not flood the surface.
3. Allow to cure and dry as long as required to attain penetration and evaporation of volatile, and in no case less than 24 hours unless otherwise acceptable to the Engineer.
4. Blot excess asphaltic with just enough sand to prevent pick-up under traffic.
5. Remove loose sand from paving.

E. Tack Coat:

1. Dilute material with equivalent parts of water and apply to contact surfaces of previously constructed asphaltic concrete or Portland cement and similar surfaces.
2. Apply at rate of 0.05 to 0.15 gal/sq yd of surface.
3. Apply tack coat by brush to contact surfaces of structures projecting into or abutting asphaltic concrete pavement.
4. Allow surface to dry until material is at condition of tackiness to receive pavement.

3.02 FRAME ADJUSTMENTS (if applicable)

A. Placing Frames:

1. Surround frames set to elevation with ring of compacted asphaltic concrete base prior to paving.
2. Place asphaltic concrete mixture up to 1 inch below top of frame, slope to grade, and compact by hand tamping.

B. Adjust frames to proper position to meet paving.

C. If permanent covers are not in place, provide temporary covers over openings until completion of rolling operations.

D. Set cover frames to grade, flush with surface adjacent pavement.

3.03 PREPARING THE MIXTURE

A. Comply with ASTM D 995 for material storage, control, and mixing and for plant equipment and operation.

B. Stockpiles:

1. Keep each component of the various-sized combined aggregates in separate stockpiles.
2. Maintain stockpiles so separate aggregate sizes will not intermix and to prevent segregation.

C. Heating:

1. Heat the asphaltic cement at the mixing plant to viscosity at which it can be uniformly distributed throughout the mixture.
2. Use Lowest possible temperature to suit temperature – viscosity of asphaltic.
3. Do not exceed 350° F.

D. Aggregate:

1. Heat – dry aggregate to reduce moisture content to not more than 2.0 percent.
2. Deliver dry aggregate to mixer at recommended temperature to suit penetration grade and viscosity characteristics of asphaltic cement, ambient temperature, and workability of mixture.
3. Accurately weigh or measure dry aggregates and weigh or meter asphaltic cement to comply with job-mix formula requirements.

E. Mix aggregate and asphaltic cement to achieve 90-95 percent of coated particles for base mixture and 85-90 percent of coated particles for surface mixture, when tested in accordance with ASTM D2489.

F. Transporting:

1. Transport asphaltic concrete mixture from mixing sit in trucks having tight, clean compartments.
2. Coat hauling compartments with a lime-water mixture to prevent asphaltic concrete mixture from sticking.
3. Elevate and drain compartment of excess solution before loading mix.
4. Provide covers over asphaltic concrete mixture when transporting to protect from weather and to prevent loss of heat.
5. During periods of cold weather or long-distance deliveries, provide insulation around entire truck bed surface.

3.04 EQUIPMENT

- A. Provide size and quantity of equipment to complete the work specified within project time schedule.
- B. Bituminous Pavers: Self-propelled that spread hot asphaltic concrete mixtures without tearing, shoving, or gouging surfaces, and control pavement edges to true lines without use of stationary forms.
- C. Rolling Equipment:
1. Self-propelled steel wheeled and pneumatic tired rollers that can reverse direction without backlash.
 2. Other type rollers may be used if acceptable to the Engineer.
- D. Hand Tools: Provide rakes, lutes, shovels, tampers, smoothing irons, pavement cutters, portable heaters, and other miscellaneous small tools to complete the Work specified.

3.05 PLACING THE MIX

- A. Place the asphaltic concrete mixture on prepared surface, spread and strike-off using paving machine.
- B. Spread mixture at a minimum temperature of 225° F.
- C. Inaccessible and small areas may be placed by hand.

- D. Place each course at thickness so when compacted it will conform to the indicated grade, cross-section, finish thickness, and density indicated.
- E. Paver Placing:
1. Unless otherwise directed, being placing along centerline of areas to be paved on crowned section, and at high side on one-way slope, and in direction of traffic flow.
 2. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips.
 3. Complete base course for a section before placing surface courses.
 4. Place mixture in continuous operation as practicable.
- F. Hand Placing:
1. Spread, tamp, and finish mixture using hand tools in area where machine spreading is not possible, as acceptable to Engineer.
- G. Joints:
1. Carefully make joints between old and new pavements, or between successive days' work, to ensure a continuous bond between adjoining work.
 2. Construct joints to have same texture, density, and smoothness as adjacent sections of asphaltic concrete course.
 3. Clean contact surface free of sand, dirt, and other objectionable material and apply tack coat.
 4. Offset transverse joints in succeeding courses not less than 24 inches.
 5. Cut back edges of previously placed courses to expose and even, vertical surface for full course thickness.
 6. Offset longitudinal joints in succeeding courses not less than 6 inches.
 7. When the edges of longitudinal joints are irregular honeycombed, or inadequately compacted, cut back unsatisfactory sections to expose and even vertical surface for full course thickness.

3.06 COMPACTING THE MIX

- A. Provide sufficient rollers to obtain the required pavement density.
- B. Begin rolling operations as soon after placing when the mixture will bear weight of roller without excessive displacement.
- C. Do not permit heavy equipment, including rollers to stand on finished surface before it has thoroughly cooled or set.
- D. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.
- E. Start rolling longitudinally at extreme lower side of sections and proceed toward center of pavement. Roll to slightly different lengths on alternate roller runs.
- F. Do not roll centers of sections first under any circumstances.
- G. Breakdown Rolling:

1. Accomplish breakdown or initial rolling immediately following rolling of transvers and longitudinal joints and outside edge.
2. Operate rollers as close as possible to paver without causing pavement displacement.
3. Check crown, grade and smoothness after breakdown rolling.
4. Repair displaced areas by locating at once with lutes or rakes and filling, if required, with hot loose material before continuing rolling.

H. Second Rolling:

1. Second rolling shall be made by traffic roller.
2. Follow breakdown rolling as soon as possible, while mixture is hot and in condition for compaction.
3. Continue second rolling until mixture has been thoroughly compacted.

I. Finish Rolling:

1. Perform finish rolling while mixture is still warm enough for removal of roller marks.
2. Continue rolling until roller marks are eliminated and course has attained specified density.

J. Patching:

1. Remove and replace defective areas.
2. Cut out and fill with fresh, hot asphaltic concrete.
3. Compact by rolling to specified surface density and smoothness.
4. Remove deficient areas for full depth of course.
5. Cut sides perpendicular and parallel to direction of traffic with edges vertical.
6. Apply tack coat to exposed surface before placing new asphaltic concrete mixture.

3.07 MARKING ASPHALTIC CONCRETE PAVEMENT

A. Cleaning:

1. Sweep surface with power brooms to remove loose material and dirt.
2. Do not begin marking asphaltic concrete pavement until acceptable to the Engineer.

B. Apply thermoplastic material as specified by FDOT Section 711 Standard Specifications

1. Provide uniform straight edges.
2. Thickness shall be as required by FDOT Section 711 Standard Specifications.

3.08 CLEANING AND PROTECTION

A. Cleaning: After completion of paving operations, clean surfaces of excess or spilled asphaltic materials to the satisfaction of the Engineer.

B. Protection:

1. After final rolling, do not permit vehicular traffic on asphaltic concrete pavement until it has cooled and hardened and in no case sooner than 6 hours.

2. Provide barricades and warning devices are required to protect pavement.
3. Cover openings of structures in the areas of paving until permanent covering are placed (if applicable)

END OF SECTION

SECTION 02960

PIPING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. The Contractor shall furnish all labor, materials, and equipment to install and complete all underground piping for potable water distribution.
- B. The Contractor shall complete the connections of all installed underground piping to the respective existing piping.

PART 2 – MATERIALS

2.01 GENERAL

- A. The Contractor shall provide underground yard piping as show on the Drawing and as listed below:
1. Potable Water: Color – blue or blue adhesive striping.
 - a. Greater than 4 inch – C-900, DR-18
 - b. Greater than 4 inch HDD – PE 4710, SDR-11
 - c. 3 inch or less – Poly Tubing

PART 3 – EXECUTION

3.01 EXCAVATION

- A. See Section 02220: Excavation, Backfilling, and Grading

3.02 INSTALLATION

- A. See Respective Piping Installations within the Mechanical Division 15.

END OF SECTION

SECTION 15000

MECHANICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. All equipment furnished and installed under this contract shall conform to the general stipulations set forth in this section except as otherwise specified in other Sections.
2. Contractor shall coordinate all details of equipment with other related parts of the Work, including verification that all structures, piping, wiring, and equipment components are compatible. Contractor shall be responsible for all structural and other alternations in the Work required to accommodate equipment differing in dimensions or other characteristics from that contemplated in the Contract Drawings or Specifications.

B. Related Work Described Elsewhere:

1. General Requirements: Division 1

- C. Contract Drawings and Specifications: The Contract Drawings and Specifications shall be considered as complementary, one to the other, so that materials and work indicated, called for, or implied by the one and not by the other shall be supplied and installed as though specifically called for by both. The Contract Drawings are to be considered diagrammatic, not necessarily showing in detail or to scale all of the equipment or minor items. In the event of discrepancies between the Contract Drawings and Specifications, or between either of these and any regulations or ordinances governing work of these specifications, the bidder shall notify the Engineer in ample time to permit revisions.

1.02 QUALITY ASSURANCE

- A. Materials and Equipment: Unless otherwise specified, all materials and equipment furnished for permanent installation in the Work shall conform to applicable standards and specifications and shall be new, unused, and undamaged when installed or otherwise incorporated in the Work. No such material or equipment shall be used by the Contractor for any purpose other than intended or specified, unless such use is specifically authorized in writing by the Owner. No material shall be delivered to the Work site workout prior acceptance of drawings and data by the Engineer.

B. Equivalent Materials and Equipment:

1. Whenever a material or article is specified or described by using the name of a proprietary product or the name of a particular manufacturer or vendor, the specific item mentioned shall be understood as establishing the type, function, and quality desired. Other manufacturers' products will be accepted provided sufficient information is submitted to allow the Engineer to determine the products proposed are equivalent to those named. Such items shall be submitted for review in accordance with Section 01340: Shop Drawings, Working Drawings, and Samples.
2. Requests for review of equivalency will not be accepted from anyone except the Contractor and such requests will not be considered until after the contract has been awarded.

- C. Governing Standards: Equipment and appurtenances shall be designed in conformity with ANSI, ASME, ASTM, IEEE, NEMA, OSHA, AGMA, and other generally accepted applicable standards. They shall be of rugged construction and of sufficient strength to withstand all stresses which may occur during

fabrication, testing, transportation, installation, and all conditions or operations. All bearings and moving parts shall be adequately protected against wear by bushings or other acceptable means. Provisions shall be made for adequate lubrication with readily accessible means.

- D. Tolerances: Machinery parts shall conform to the dimensions indicated on the Drawings within allowable tolerances. Protruding members such as joints, corners, and gear covers shall be finished in appearance. All exposed welds shall be ground smooth, and the corners of structural shapes shall be rounded or chamfered.
- E. Clearances: Ample clearances shall be provided for inspection and adjustment. All equipment shall fit the allotted space and shall leave reasonable access room for servicing and repairs. Greater space and room required by substituted equipment shall be provided by the Contractor and at his expense.
- F. Testing:

- 1. When the equipment is specified to be factory tested, the results of the tests shall be submitted to the Engineer and approval of the test results shall be obtained before shipment of the equipment.
- 2. When an item of equipment, including controls and instrumentation, has been completely erected, the Contractor shall notify the Engineer, who will designate a time to make such tests as required, and operate the item to the satisfaction of the Engineer. All testing shall be done in the presence of the Engineer or Resident Project Representative. "Completely erected" shall mean the installation is erected, all necessary adjustments have been made, all required utility connections have been made, required lubricants and hydraulic fluid have been added and the unit has been cleaned and painted.

G. Pressure Test:

- 1. After installation, all piping shall be pressure tested. Piping shall be tested in accordance with Section 15044: Pressure Testing of Piping.
- 2. All tests shall be made in the presence of, and to the satisfaction of, the Engineer and to the satisfaction of any local or state inspector having jurisdiction.
 - a. Provide not less than three (3) days' notice to the Engineer and the authority having jurisdiction when it is proposed to make the tests.
 - b. Any piping or equipment that has been left unprotected and subject to mechanical or other injury, in the opinion of the Engineer, shall be retested in part or in whole, as directed by the Engineer.
 - c. The piping systems may be tested in section as the Work progresses but no joint or portion of the system shall be left untested.
- 3. All elements within the system that may be damaged by the testing operation, shall be removed or otherwise protected during the operation.
- 4. All defects and leak observed during the tests shall be corrected and made tight, in an approved manner, and the tests repeated until the system is proven tight.
- 5. Repair all damage done to existing or adjacent work materials due to or on account of the tests.
- 6. Provide test pumps, gauges, or other instruments and equipment required for the performance of all tests. Provide all temporary bracing, test plugs, additional restraint, and thrust blocking which may be required for test pressures above normal working pressures.

7. All tests shall be maintained for as long a time as required to detect all defects and leaks but not less than the duration specified for each type of pipe or piping system in this Division.

H. Failure of Test:

1. Defects: Any defects in the equipment, or deviations from the guarantees or requirements of the Specifications, shall be promptly corrected by the Contractor by replacements or otherwise. The decision of the Engineer as to whether or not the Contractor has fulfilled his obligations under the Contract shall be final and conclusive. If the Contractor fails to correct any defects or deviations, or if the replaced equipment when tested shall fail again to meet the guarantees or specified requirements, the Owner, notwithstanding his having made partial payment for work and materials which have entered into the manufacturer for such equipment, may reject that equipment and order the Contractor to remove it from the premises at the Contractor's expense.
2. Rejection of Equipment: In case the Owner rejects a particular item of equipment, then the Contractor hereby agrees to repay to the Owner all sums of money paid to him to deliver to the Contractor a bill of sale of all his rights, title, and interest in and to the rejected equipment provided, however that the equipment shall not be removed from the premises until the Owner obtains from other sources other equipment to take the place of that rejected. The bill of sale shall not abrogate the Owner's right to recover damages for delays, losses or other conditions arising out of the basic Contract. The Owner hereby agrees to obtain the alternate equipment within a reasonable time and the Contractor agrees that the Owner may use the original equipment furnished by him without rental or other charge until the other equipment is obtained.

- I. Responsibility During Tests: The Contractor shall be fully responsible for the proper operation of equipment during tests and instruction periods and shall neither have nor make any claim for damage which may occur to equipment prior to the time when the Owner formally takes over the operation thereof.

J. Acceptance of Materials:

1. Only new materials and equipment shall be incorporated in the Work. All materials and equipment furnished by the Contractor shall be subject to the inspection and acceptance of the Owner. No material shall be delivered to the Work without prior submittal approval of the Engineer.
2. The Contractor shall submit to the Engineer data relating to materials and equipment he proposes to furnish for the Work. Such data shall be in sufficient detail to enable the Engineer to identify the particular product and to form an opinion as to its conformity to the Specifications.
3. Facilities and labor for handling and inspection of all materials and equipment shall be furnished by the Contractor. If the Engineer requires, either prior to beginning or during the progress of the Work, the Contractor shall submit samples of materials for such special test as may be necessary to demonstrate that they conform to the Specifications. Such sample shall be furnished, stored, packed, and shipped as directed at the Contractor's expense. Except as otherwise noted, the Owner will make arrangements for and pay for tests.
4. The Contractor shall submit data and samples sufficiently early to permit consideration and acceptance before materials are necessary for incorporation in the Work.

K. Safety Requirements:

1. In addition to the components shown and specified, all machinery and equipment shall be safeguarded in accordance with the safety features required by the current codes and regulations of ANSI, OSHA, and local industrial codes.

2. The Contractor shall provide for each V-belt drive or rotating shaft a protective guard which shall be securely bolted to the floor or apparatus. The guard shall completely enclose drives and pulleys and be constructed to comply with all safety requirements.

1.03 SUBMITTALS

- A. See Section 01340: Shop Drawings, Working Drawings, and Samples.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Packaging: All equipment shall be suitably packaged to facilitate handling and protect against damage during transit and storage. All equipment shall be boxed, crated, or otherwise completely enclosed and protected during shipment, handling, and storage. All equipment shall be protected from exposure to the elements and shall be kept thoroughly dry at all times.
- B. Protection: All machined surfaces and shafting shall be cleaned and protected from corrosion by the proper type and amount of coating necessary to assure protection during shipment and prior to installation. Painted surfaces shall be protected against impact, abrasion, discoloration, and other damage as specified in Sections 09900: Painting. All painted surfaces which are damaged prior to acceptance of equipment shall be repainted to the satisfaction of Engineer.
- C. Lubrication: Grease and lubricating oil shall be applied to all bearings and similar items as necessary to prevent damage during shipment and storage.
- D. Marking: Each item of equipment shall be tagged or marked as identified in the delivery schedule or on the Shop Drawings. Complete packing lists and bills of material shall be included with each shipment.
- E. Fabricated sub-assemblies, if any, shall be shipped in convenient sections as permitted by carrier regulations and shall be properly match-marked for ease of field erection.
- F. Responsibility:
 1. The Contractor shall be responsible for all material, equipment, and supplies sold and delivered to the site under this Contract until final inspection of the Work and acceptance thereof by the Owner. In the event any such material, equipment, and supplies are lost, stolen, damaged, or destroyed prior to final inspection and acceptance, the Contractor shall replace same without additional cost to the Owner.
 2. Should the Contractor fail to take proper action on storage and handling of equipment supplied under this Contract within seven days after written notice to do so has been given, the Owner retains the right to correct all deficiencies noted in previously transmitted written notice and deduct the cost associated with these corrections from the Contractor's Contract. These costs may be comprised of expenditures for labor, equipment usage, administrative, clerical, engineering, and any other costs associated with making the necessary corrections.
- G. Delivery: The Contractor shall arrange deliveries of products in accordance with construction schedules and coordinate to avoid conflict with work and conditions at the site.
 1. The Contractor shall deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
 2. Immediately on delivery, the Contractor shall inspect shipments to assure compliance with requirements of Contract Documents and accepted submittals, and that products are properly protected and undamaged.
 3. Under no circumstances shall the Contractor deliver equipment to the site more than one month prior to installation without written authorization from the Engineer. Operation and maintenance data shall be submitted to the Engineer for review prior to shipment of equipment as described in Section 01730: Operating and Maintenance Data.

H. Storage and Protection of Products:

1. The Contractor shall furnish a covered, weather-protected storage structure providing a clean, dry noncorrosive environment for all mechanical equipment, valves, architectural items, electrical and instrumentation equipment, and special equipment to be incorporated into this project. Storage of equipment shall be in strict accordance with the "Instructions for Storage" of each equipment supplier and manufacturer including connection of space heaters and placing of storage lubricants in equipment. Corroded, damaged, or deteriorated equipment and parts shall be replaced before acceptance of the project. Equipment and materials not properly stored will not be included in a payment estimate.
 - a. The Contractor shall store products subject to damage by the elements in weathertight enclosures.
 - b. The Contractors shall maintain temperature and humidity within the ranges required by the manufacturer's instructions.
 - c. The Contractor shall store fabricated products above the ground, on blocking or skids, to prevent soiling or staining. The Contractor shall cover products which are subject to deterioration with impervious sheet coverings and provide adequate ventilation to avoid condensation.
 - d. The Contractor shall store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.
 2. All materials and equipment to be incorporated in the Work shall be handled and stored by the Contractor before, during, and after shipment in a manner to prevent warping, twisting, bending, breaking, chipping, rusting, and any injury, theft, or damage of any kind whatsoever to the material or equipment.
 3. Cement, sand, and lime shall be stored under a roof and off the ground and shall be kept completely dry at all times. All structural and miscellaneous steel and reinforcing steel shall be stored off the ground or otherwise to prevent accumulations of dirt or grease, and in a position to prevent accumulations of standing water, staining, chipping, or cracking. Brick, block, and similar masonry products shall be handled and stored in a manner to reduce breakage, chipping, cracking, and spalling to a minimum.
 4. All materials which, in the opinion of the Engineer, have become damaged and are unfit for the use intended or specified, shall be promptly removed from the site of the Work and the Contractor shall receive no compensation for the damaged material or its removal.
 5. The Contractor shall arrange storage in a manner to provide easy access for inspection. The Contractor shall make periodic inspections of stored products to assure products are maintained under specified conditions, and free from damage or deterioration.
 6. Protection After Installation: The Contractor shall provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. The Contractor shall remove covering when no longer needed.
- I. Extended Storage Requirements for Equipment: Because of the long period allowed for construction, special attention shall be given to extended storage and handling of equipment onsite. As a minimum, the procedure specified herein shall be followed:
1. If equipment will be stored onsite for more than one month prior to incorporation into the Work, the Contractor shall submit a written request to the Engineer outlining any special provision to be made to protect and maintain the equipment while it is being stored. All such provisions shall be acceptable to the Owner. No equipment shall be stored onsite for more than one month without prior written authorization from the Engineer.

2. All equipment having moving parts, including gears, electric motors, and/or instruments, shall be stored in a temperature and humidity-controlled building accepted by the Engineer, until such time as the equipment is to be installed.
3. All equipment shall be stored fully lubricated with oil and grease unless otherwise instructed by the manufacturer.
4. Manufacturer's storage instructions shall be carefully studied by the Contractor and reviewed by him with the Engineer. These instructions shall be carefully followed, and a written record of this review kept by the Contractor.
5. Moving parts shall be rotated a minimum of once weekly to ensure proper lubrication and to avoid metal-to-metal "welding". Upon installation of the equipment, the Contractor shall start the equipment and operate, loaded, when possible, once weekly for an adequate period of time to ensure that the equipment does not deteriorate from lack of use.
6. Lubricants shall be changed upon completion of installation and as frequently as required thereafter during the period between installation and acceptance. Mechanical equipment to be used in the Work, if stored for longer than ninety days, shall have the bearings cleaned, flushed, and lubricated prior to testing and startup, at no extra cost to the Owner.
7. Prior to acceptance of the equipment, the Contractor shall have the manufacturer inspect the equipment and certify that its condition has not been detrimentally affected by the long storage period. Such certifications by the manufacturer shall be deemed to mean the equipment is judged by the manufacturer to be in a condition equal to that of equipment that has been shipped, installed, tested, and accepted in a minimum time period. As such, the manufacturer will guarantee the equipment equally in both instances. If such a certification is not given, the equipment shall be judged to be defective, and it shall be removed and replaced at the Contractor's expense.
8. A maintenance log shall be maintained by the Contractor outlining the schedule of maintenance required for each piece of equipment as well as the date on which the maintenance was actually performed and the initials of the individual performing the work. Submit a copy of the maintenance log monthly with the progress pay application.

1.05 WARRANTY AND GUARANTEES

- A. The manufacturer's written warranty shall be submitted for all major pieces of equipment, as specified in Section 01740: Warranties and Bonds. The manufacturer's warranty period shall be concurrent with the Contractor's correction period for one year after the time of completion and acceptance.

1.06 MAINTENANCE MATERIALS

- A. All grease, oil, and fuel required for testing of equipment shall be furnished with the respective equipment. The Owner shall be furnished with a year's supply of required lubricants including grease and oil of the type recommended by the manufacturer with each item of equipment supplied.
- B. The Contractor shall be responsible for changing the oil in all drives and intermediate drives of each mechanical equipment after the initial break-in of the equipment, which in not event, shall be any longer than three (3) weeks of operation.

PART 2 – PRODUCTS

2.01 FABRICATION AND MANUFACTURE

- A. Workmanship and Materials:

1. Contractor shall guarantee all equipment against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, and leakage, breakage, or other failure. Materials shall be suitable for service conditions.
2. All equipment shall be designed, fabricated, and assembled in accordance with recognized and acceptable engineering and shop practice. Individual parts shall be manufactured to standard sizes and gages so that repair parts, furnished at any time, can be installed in the field. Like parts of duplicate units shall be interchangeable. Equipment shall not have been in service at any time prior to delivery, except as required by tests.
3. Except where otherwise specified, structural and miscellaneous fabricated steel used in equipment shall conform to AISC standards. All structural members shall be designed for shock or vibratory loads. Unless otherwise specified, all steel, which will be submerged, all or in part, during normal operation of the equipment, shall be at least 1/4 inch thick.

B. Lubrication:

1. Equipment shall be adequately lubricated by systems which require attention no more frequently than weekly during continuous operation. Lubrication systems shall not require attention during startup or shutdown and shall not waste lubricants.
2. Lubricants of the type recommended by the equipment manufacturer shall be furnished by the Contractor in sufficient quantity to fill all lubricant reservoirs and to replace all consumption during testing, startup, and operation prior to acceptance of equipment by Owner. Unless otherwise specified or permitted, the use of synthetic lubricants will not be acceptable.
3. Lubrication facilities shall be convenient and accessible. Oil drains and fill openings shall be easily accessible from the normal operating area or platform. Drains shall allow for convenient collection of waste oil in containers from the normal operating area or platform without removing the unit from its normal installed position.

- C. Safety Guards: All belt or chain drives, fan blades, couplings, and other moving or rotating parts shall be covered on all sides by a safety guard. Safety guards shall be fabricated from 16 USS gage or heavier galvanized aluminum-clad sheet steel or 1/2 inch mesh galvanized expanded metal or 316 stainless steel mesh. Each guard shall be designed for easy installation and removal. All necessary supports and accessories shall be provided for each guard. Supports and accessories, including bolts, shall be galvanized. All safety guards in outdoor locations shall be designed to prevent the entrance of rain and dripping water.

D. Equipment Foundation Supports:

1. All foundations, platforms, and hangers required for the proper installation of equipment shall be furnished and installed by the Contractor.
2. Unless otherwise indicated or specified, all equipment shall be installed on reinforced concrete bases at least 6 inches high. Cast iron or welded steel baseplates shall be provided for pumps, compressors, and other equipment. Each unit and its drive assembly shall be supported on a single baseplate of neat design. Baseplates shall have pads for anchoring all components and adequate grout holes. Baseplates for pumps shall have a means for collecting leakage and a threaded drain connection. Baseplates shall be anchored to the concrete base with suitable anchor bolts and the space beneath filled with grout. All open equipment bases shall be filled with non-shrinking grout sloped to drain to the perimeter of the base.

3. The Contractor shall furnish, install, and protect all necessary guides, bearing plates, anchor and attachment bolts, and all other appurtenances required for the installation of equipment. These shall be of ample size and strength for the purpose intended.
4. Equipment suppliers shall furnish suitable anchor bolts for each item of equipment. Anchor bolts, together with templates or setting drawings, shall be delivered sufficiently early to permit setting the anchor bolts when the structural concrete is placed. Anchor bolts shall have, unless otherwise specified, a minimum diameter of $\frac{3}{4}$ inch. Unless otherwise indicated or specified, anchor bolts, for items of equipment mounted on baseplates, shall be long enough to permit 1 $\frac{1}{2}$ inches of grout beneath the baseplate and to provide adequate anchorage into structural concrete.
5. Structural steel supports and miscellaneous steel required for supporting and/or hanging equipment and piping furnished under this Division shall be provided and installed by Contractor.
6. All foundations, anchor pads, piers, thrust blocks, inertia blocks and structural steel supports shall be built to template and reinforced as required for loads imposed on them.
7. The Contractor shall assume all responsibility for sizes, locations and design of all foundations, anchor pads, pier, thrust blocks, inertia blocks, curbs, and structural steel supports.

E. Shop Painting:

1. All steel and iron surfaces shall be protected by suitable paint or coatings applied in the shop. Surfaces which will be inaccessible after assembly, shall be protected for the life of the equipment. Exposed surfaces shall be finished smooth, thoroughly cleaned, and filled as necessary to provide a smooth uniform base for painting. Electric motors, speed reducers, starters, and other self-contained or enclosed components shall be shop primed or finished with a high-grade oil-resistant enamel suitable for coating in the field with an alkyd enamel. Coatings shall be suitable for the environment where the equipment is installed.
2. Surfaces to be painted after installation shall be prepared for painting as recommended by the paint manufacturer for the intended service, and then shop painted with one or more coats of the specified primer.
3. Machined, polished, and nonferrous surfaces which are not to be painted shall be coated with rust-preventive compound, Houghton "Rust Veto 344", Rust-Oleum "R-9", or equal.

F. Nameplates: Contractor shall provide equipment identification nameplates for each item of equipment. Nameplates shall be $\frac{1}{8}$ inch, Type 304 stainless steel and shall be permanently fastened. Plates shall be fastened using round head metallic drive screws, or where metallic drive screws are impractical, with stainless steel pop rivets. Metallic drive screws shall be brass or stainless steel, Type V and No. 8 by $\frac{3}{8}$ inch long. Names and/or equipment designations shall be engraved on the plates and the engraving painted with a primer and black paint system compatible with stainless steel. Contractor shall submit a list of proposed names and designations for review prior to fabrication of nameplates. At a minimum, each nameplate shall include equipment manufacturers name, year of manufacture, serial number, and principal rating data.

G. Noise Attenuation and Control:

1. Unless otherwise specified, the maximum permissible noise level for a complete installed piece of equipment located within or outside a structure shall not exceed 85 dB at 3 feet. A complete piece of equipment includes the driver and driven equipment, plus any intermediate couplings, gears, and auxiliaries. All equipment provided herein that is specified to be factory and field tested shall be tested as specified herein for noise generation at the equipment manufacturer's expense.

2. Maximum permissible noise (sound pressure) levels shall be in decibels as read on the "A" weighting scale of a standard sound level meter (dB); all measurements shall be made in relation to a reference pressure of 0.0002 microbar. Measurements of emitted noise levels shall be made on a sound level meter meeting at least the Type 2 requirements set forth in ANSI S1.4: Specification for Sound Level Meters. The sound level meter shall be set on the "A" scale and to slow response. Unless otherwise specified for a particular piece of equipment, the point of measurement of sound level shall be made at the specified distance from any major surface along the entire perimeter and at midheight of the piece of equipment, or at the specified distance from an outer major surface encompassing the sound source including inlets or outlets.

H. Fire Hazard Rating:

1. All piping, duct work, and equipment insulation, fastener, and jacketing materials shall have a fire hazard rating not to exceed 25 for flame spread, 50 for fuel contributed, and 50 for smoke developed. Rating shall be determined by ASTM Designation E84: "Surface Burning Characteristics of Building Materials". Corresponding ratings determined by Underwriters' Laboratories, Inc., UL-723, "Test Method for Fire Hazard Classification of Building Materials", will also be acceptable.
2. Flameproofing treatments will not be acceptable.

2.02 ACCESSORIES

- A. Special Tools and Accessories: Equipment requiring periodic repair and adjustment shall be furnished complete with all special tool, instruments, and accessories required for proper maintenance. Equipment requiring special devices for lifting or handling shall be furnished complete with those devices.
- B. Fasteners: All nuts, bolts, anchors, and other fastening devices shall be a minimum of 304 stainless steel unless otherwise specified.

PART 3 – EXECUTION

3.01 INSTALLATION AND OPERATION

- A. Installation: Equipment shall not be installed or operated except by, or with the guidance of, qualified personnel having the knowledge and experience necessary for proper results. When so specified, or when employees of the Contractor or his subcontractors are not qualified, such personnel shall be field representatives of the manufacturer of the equipment or materials being installed.
 1. The Contractor shall have on-site sufficient proper construction equipment and machinery of ample capacity to facilitate the Work and to handle all emergencies normally encountered in work of this character. To minimize field erection problems, mechanical units shall be factory assembled when practical.
 2. Equipment shall be erected in a neat and workmanlike manner on the foundations and supports at the locations and elevations shown on the Drawings, unless otherwise directed by the Engineer.
 3. All equipment shall be installed in such a manner as to provide access for routine maintenance including lubrication.
 4. For equipment such as pumping units, which require field alignment and connections, the Contractor shall provide the services of the equipment manufacturer's qualified mechanic, millwright, machinist, or authorized representative, to align the pump and motor prior to making piping connections or anchoring the pump base.

5. Equipment of portable nature, which requires no installation, shall be delivered to a location designated by the Owner.
- B. Tolerances: Precision gauges and levels shall be used in setting all equipment. All piping and equipment shall be perfectly aligned, horizontally and vertically. Tolerances for piping and equipment installation shall be ½ inch to 30 ft horizontal and vertically. All valves and operators shall be installed in the position shown on the Contract Drawings or as directed by the Engineer, if not shown.
- C. Alignment and Level: The equipment shall be brought to proper level by shims (1/4 inch maximum). After the machine has been leveled and aligned, the nuts on the anchor bolts shall be tightened to bind the machine firmly into place against the wedges or shims.
- D. Grouting: The grout shall be tamped into position with a board, steel bar, or other tool. Tamping should not be so hard as to raise, or otherwise, displace the plate.
- E. Contact of Dissimilar Metals: Where the contact of dissimilar metal may cause electrolysis and where aluminum will contact concrete, mortar, or plaster, the contact surface of the metals shall be separated using not less than one coat of zinc chromate primer and one heavy coat of aluminum pigmented asphalt paint on each surface.
- F. Cutting and Patching: All cutting and patching necessary for the Work shall be performed by the Contractor.
- G. Operation: All equipment installed under this Contract, including that furnished by Owner or others under separate contract, shall be placed into successful operation according to the written instructions of the manufacturer or the instructions of the manufacturer's field representative. All required adjustments, tests, operation checks, and other startup activity shall be provided.

3.02 OBSERVATION OF PERFORMANCE TESTS

- A. Where the specifications require observation of performance tests by the Engineer or Resident Project Representative, such tests shall comply with the quality assurance paragraph in this Section.

3.03 MANUFACTURER'S FIELD SERVICES

- A. Services Furnished Under This Contract:
 1. An experienced, competent, and authorized representative of the manufacturer of each item of equipment shall visit the site of the Work and inspect, check, adjust if necessary, and approve the equipment installation. In each case, the manufacturer's representative shall be present when the equipment is placed in operation. The manufacturer's representative shall revisit the jobsite as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of Engineer.
 2. Each manufacturer's representative shall furnish to Owner and Engineer a letter of certification stating that the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily.
 3. All costs for field services shall be included in the contract amount.

END OF SECTION

SECTION 15044

PRESSURE TESTING OF PIPING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: This section specifies the leakage testing requirements for plant piping.
- B. Test Pressures: Test pressure for the various services and types of piping are shown in Table at the end of this Section.
- C. Testing Records:
 - 1. Provide a record of each piping installation during the testing. These records shall include:
 - a. Date of test.
 - b. Identification of pipeline tested or retested.
 - c. Identification of pipeline material.
 - d. Identification of pipe specification.
 - e. Test fluid.
 - f. Test Pressure.
 - g. Remarks: Leaks identified (type and location), types of repairs, or corrections made.
 - h. Certification by Contractor that the leakage rate measure conformed to the Specifications.
 - i. Signature of Owner's representative witnessing pipe test.
 - 2. Submit an electronic copy of the test records to the Engineer's representative upon completion of the testing.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Testing fluid shall be water for all hydrostatic tests unless pneumatic test is included.

2.02 MATERIALS AND EQUIPMENT

- A. Provide pressure gauges, pipes, bulkheads, pumps, and meters to perform the hydrostatic and pneumatic testing.

PART 3 – EXECUTION

3.01 TESTING PREPARATION

- A. Pipes shall be in place and anchored before commencing pressure testing.
- B. Conduct hydrostatic and pneumatic tests on exposed and aboveground piping after the piping has been installed and attached to the pipe supports, hangers, anchors, expansion joints, valves, and meters.

- C. Before conducting hydrostatic tests, flush pipe with water to remove dirt and debris. For pneumatic tests, blow air through the pipes.
- D. Test new pipelines which are to be connected to existing pipelines by isolating the new line from the existing line by means of pipe caps, special flanges, or blind flanges. After the new line has been successfully tested, remove caps or flanges, and connect to the existing piping.
- E. Conduct hydrostatic tests on buried pipe after the trench has been completely backfilled. The pipe may be partially backfilled, and the joints left exposed for inspection for an initial leakage test. Perform the final test, however, after completely backfilling and compacting the trench.
- F. Pressure Test:
 - 1. All tests shall be made in the presence of, and to the satisfaction of, the Owner or Engineer and any local or state inspector having jurisdiction.
 - a. Provide not less than three (3) days' notice to the Owners, Engineer, and the authority having jurisdiction when it is proposed to make the tests.
 - b. Any piping or equipment that has been left unprotected and subject to mechanical or other injury, in the opinion of the Engineer, shall be retested in part or in whole, as directed by the Engineer.
 - c. The piping systems may be tested in sections as the Work progresses, but no joint or portion of the system shall be left untested.
 - 2. All elements within the system that may be damaged by the testing operation shall be removed, or otherwise protected during the operation.
 - 3. Repair all damage done to existing or adjacent work or materials due to or on account of the tests.

3.02 INSPECTION AND TESTING

- A. Hydrostatic Testing of Aboveground or Exposed Piping: Open vents at high points of the piping system to purge air while the pipe is being filled. Subject the piping system to the test pressure indicated. Maintain the test pressure for a minimum of 2 hours. Examine joints, fittings, valves, and connections for leaks. The piping system shall show no leakage or weeping. Correct leaks and retest until no leakage is obtained.
- B. Hydrostatic Testing of Buried Piping:
 - 1. Where any section of the piping contains concrete thrust blocks or encasement, do not make the pressure test until at least 10 days after the concrete has been poured. When testing mortar-lined piping, fill the pipe to be tested with water and allow it to soak for at least 48 hours to absorb water before conducting the pressure test.
 - 2. Apply and maintain the test pressure by means of a hydraulic force pump. Maintain the test pressure for a minimum duration of 4 hours. After the test pressure is reached, use a meter to measure the additional water added to maintain the pressure during the four hours. This amount of water is the loss due to leakage in the piping system. The allowable leakage rate is defined by the formula: $L = \frac{SD(P)^{1/2}}{133,200}$, where:

L = allowable leakage (gallons/hour) during the test period	D = diameter of pipe (inches)
S = length of pipe (feet)	P = specified test pressure (psig)

3. Repair and retest any pipes showing leakage rates greater than that allowed.

Service	Mark	Test Pressure (psig)
Domestic Water Pipe	CW/HW	150

END OF SECTION

SECTION 15062

DUCTILE IRON AND PIPE FITTINGS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: Furnish all labor, materials, equipment, and incidentals required and install, in the locations inside, and under buildings and structures as shown on the Drawings, all ductile iron piping, ductile iron fittings, and appurtenances as specified herein.
- B. General Design: The equipment and materials specified herein is intended to be standard types of ductile iron pipe and cast or ductile iron fittings for use in transporting sewage, sludges, water, and reclaimed water.

1.02 QUALITY ASSURANCE

- A. Qualifications: All the ductile iron pipe and ductile iron fittings shall be furnished by manufacturers who are fully experienced, reputable, and qualified in the manufacture of the materials to be furnished. The pipe and fittings shall be designed, constructed, installed in accordance with the best practices and methods and shall comply with these specifications as applicable.
- B. Standards:
 - 1. AWWA C150
 - 2. AWWA C151
 - 3. AWWA C1047
 - 4. AWWA C110
 - 5. AWWA C153
 - 6. AWWA C105
 - 7. AWWA C600
 - 8. AWWA C651
- C. Quality Control:
 - 1. The manufacturer shall establish the necessary quality control and inspection practice to ensure compliance with the referenced standards.
 - 2. In addition to the manufacturer's quality control procedures, the Owner may select an independent testing laboratory to inspect the material at the foundry for compliance with these specifications. The cost of foundry inspection requested by the Owners will be paid for by the Owner.
- D. Equipment Manufacturers: (or equal)
 - 1. American Cast Iron Pipe Co.
 - 2. U.S. Pipe and Foundry
 - 3. Griffin
 - 4. McWane

1.03 SUBMITTALS

- A. Material and Shop Drawings:
 - 1. Submit Shop Drawings, including pipeline layouts, within and under buildings and structures. Shop Drawings shall include dimensioning, methods and locations of supports and all other pertinent technical specifications. Shop drawings shall be prepared by the pipe manufacturer.

Shop Drawings for piping within and under buildings and structures shall be submitted within 30 days of Execution of Contract.

B. Operating Instructions: Submit Operation and Maintenance Manuals in accordance with Section 01730.

C. Manufacturer's Certification: Submit certification of compliance with the following:

1. Factory tests and results
2. Dimensions and weights of fittings per respective AWWA Standard.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage: Delivery and storage of the materials shall be in accordance with the manufacturer's recommendations.

B. Handling: Care shall be taken in loading, transporting, and unloading to prevent damage to the pipe or fittings and their respective coatings. Pipe or fittings shall not be rolled off the carrier or dropped. Unloading shall be done by lifting with a forklift or crane. All pipe or fittings shall be examined before laying, and no piece shall be installed which is found to be defective.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Ductile Iron Pipe:

1. Standards:

- a. AWWA C150
- b. AWWA C151

2. Thickness:

- a. Below ground piping: Pipes shall be the following minimum thickness class unless otherwise noted or specified:
 - 1) 12 inch or smaller: Class 350
 - 2) 14-20 inch diameter: Class 250

3. Joints:

- a. Push-on or Mechanical Joints (below ground piping):
 - 1) Standards: AWWA C111
 - 2) Class: The working pressure of the joint shall be equal to or exceed the rated working pressure of the pipe.
 - 3) Gaskets: SBR (Styrene Butadine Rubber)
- b. Flanged (above ground or inside below ground vaults):
 - 1) Standards: ANSI A-21.15, ANSI B-16.1
 - 2) Class: 125lb factory applied screwed long hub flanges, plain faced without projection.
 - 3) Gaskets:

- (a) Spans less than 10 feet: full face 1/8 inch tick neoprene rubber
 - (b) Spans greater than 10 feet: Toroseal gaskets as manufactured by American Cast Iron Pipe or equal.
- c. Restrained Joints:
 - 1) Manufactured: "Flex-Ring" or "Lok-Ring" restrained joint system as manufactured by American Ductile Iron Pipe, "Super Lock" as manufactured by Clow-McWane, Inc., or equal.
 - 2) Gasket: "Fast-Grip" as manufactured by American Ductile Iron Pipe, "Field Lok" as manufactured by U.S. Pipe or equal.
 - (a) Maybe used only for pipe sizes 4 -24 inch on straight runs of pipe.
 - (b) Shall not be used for:
 - (1) Fittings
 - (2) Within bore and jack casings
 - 3) Mechanical Restraining Devices: "Meg-a-Lug" system as manufactured by EBBA Iron or equal.
 - 4) Class: 250 psi (minimum) design pressure rating
 - 5) Standard mechanical joint retainer glands will not be acceptable
- d. Joint Accessories:
 - 1) Mechanical joint bolts, washers, and nuts: Ductile Iron or Corten steel
 - 2) Flanged joint bolts, washers, and nuts:
 - (a) Above ground: Hot dipped galvanized, Grade B, ASTM A-307
 - (b) Below ground: 304 stainless steel
- e. Pipe Length (below ground installation): 20 feet maximum nominal length.

B. Fittings:

- 1. Materials: Ductile Iron or grey cast iron, AWWA C110.
- 2. Pressure Class:
 - a. Mechanical Joint, Restrained Joint: Minimum 250 psi pressure rating.
 - b. Flanged Joint: Class 125, plain
- 3. Compact Fittings: AWWA C153 (4-24 inch diameter only)

2.02 COATINGS, MARKINGS, AND LININGS

A. Exterior Coatings:

- 1. Below ground or in casing pipe:
 - a. Type: Asphaltic coating, 1.0 mil DFT

- b. Markings: (continuous 2 inch wide strip within top 90 degrees of pipe – min. drying time 30 minutes before backfill). All ductile iron pipe shall be marked with a continuous stripe located within the top 90 degrees of the pipe. Said stripe shall be a minimum 2 inches in width and shall be painted blue in color. Backfill shall not be placed for 30 minutes following paint application. At the Contractor's option, the pipe may be stripe marked prior to pipe installation as follows:

- 1) Up to 8 inch diameter: (2) 2 inch wide @ 180°
- 2) 10 to 16 inch diameter: (3) 2 inch wide @ 120°

Alternately, all ductile iron pipe may be marked along the crown of the pipe with an adhesive Underground Utility marking tape. Said tape shall be a minimum 6 inches width with a minimum 4.0 mil overall thickness inert plastic film formulated for extended use underground. Tape shall be specified and supplied in accordance with the A.P.W.A. national color code and shall be imprinted with the appropriate legend to define the type of utility line it protects.

- c. Color: Potable Water – Blue

B. Interior Lining (Applied by pipe manufacturer):

- 1. Potable Water Service: Ductile iron pipe and ductile and grey iron fittings for water service shall have a cement mortar lining in accordance with AWWA C104. The lining shall be listed by ANSI/NSF Standard 61 for potable water contact.

C. Polyethylene Encasement (required for all below ground piping, fittings, and appurtenances located less than 10 feet from a gas main as indicated on the Drawings):

- 1. Standard: AWWA C105, 8 mil minimum thickness
- 2. Color: Color coded per paragraph A.1. above.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Standards: AWWA C600-87

B. Underground Ductile Iron Pipe and Fittings:

- 1. Bedding for Ductile Iron Pipe: Minimum bedding requirements shall be Type 4 as defined in ANSI/AWWA C600, latest revision. Provide proper bedding required, in accordance with thickness class of pipe being laid and depth of cover. Property pipe laying conditions shall be in accordance with ANSI/AWWA C150 and C151, latest revisions, and ANSI/AWWA C600 latest revision.
- 2. Placement: Alignment: In accordance with lines and grades shown on the Drawings. Deflection of joints shall not exceed 75 percent of that recommended by manufacturer.
- 3. Cutting: When required, cutting shall be done by machine, leaving a smooth but at right angles to the axis of the pipe. Cut ends of the pipe to be used with a push-on bell shall be beveled.
- 4. Joints:
 - a. Placement:

- 1) Push-on joints: Pipe shall be laid with the bell ends facing upstream. The gasket shall be inserted, and the joint surfaces cleaned and lubricated prior to placement of the pipe. After joining the pipe, a metal feeler shall be used to verify the gasket is correctly located.
- 2) Mechanical joints: Pipe and fittings shall be installed in accordance with the "Notes on Method of Installation" under AWWA C111. The gasket shall be inserted, and the joint surfaces cleaned and lubricated with soapy water before tightening the bolts to the specified torque.

C. Above ground and interior ductile iron pipe and fittings:

1. Pipe Supports:

- a. General: All piping shall be properly supported with hangers, supports, base elbows, and tees, concrete piers and pads as shown on the Drawings. All pipe and appurtenances connected to equipment shall be supported to prevent any strain from being imposed on the equipment.
- b. Support Spacing: 8 feet in centers, at each fitting and where shown on the Drawings.
- c. Hangers for Horizontal Piping:
 - 1) Material: Heavy malleable iron
 - 2) Type: Adjustable, swivel, split ring or adjustable swivel, pip-roll
- d. Hangers for Vertical Piping:
 - 1) Material: Wrought Iron
 - 2) Type: Clamp

2. Placement:

- a. Alignment: In accordance with lines and grades shown on the Drawings. Each section of pipe shall be cleaned thoroughly prior to installation.
- b. Flanges Joints: Joints shall be fitted so the contact faces bear uniformly on the gasket.

D. Thrust Restraint:

1. General: Thrust restraint shall be accomplished by restrained joints.
2. Length of Restrained Joints: In accordance with the lengths shown on the Drawings.

3.02 CLEANING

- A. General: At the conclusion of the Work, the Contractor shall thoroughly clean the new pipe lines by flushing with water, or other means, to remove all dirt, stones or other material which may have entered the line during the construction period.
- B. Correction of Non-Conforming Work: Non-conforming work shall be defined as failure to adhere to any specific or implied directive of this Project Manual and/or the drawings, including but not limited to pipe not laid straight, true to the lines and grades as shown on the drawings, damaged or unacceptable materials, misalignment or diameter ring deflection in pipe due to bedding or backfilling, visible or detectable leakage and failure to pass any specified test or inspection. All non-conforming work shall be repaired or replaced by the Contractor at no additional expense to the Owner.

3.03 FIELD TESTING

A. General: At least ten (10) days prior to beginning testing, the Contractor shall submit a testing plan to the Engineer for review.

B. Pressure Piping:

1. General: The Contractor shall perform hydrostatic pressure and leakage tests on all pressure piping.
2. Standard: AWWA C600, Section 4, with the exceptions required herein and the exception the Contractor shall furnish all gauges, meters, pressure pumps and other equipment needed to test the lines.

3. Hydrostatic Pressure Test:

- a. Test Pressure: 50 percent above the normal working pressure, but not less than 150 psi, unless otherwise noted on the Drawings.
- b. Test Duration: 24 hours
- c. Air Release: Corporation cocks at least $\frac{3}{4}$ inch in diameter, pipe riser, and angle globe valves shall be provided at each dead-end to bleed air from the line.

4. Hydrostatic Leakage Test:

- a. General: Following the pressure test, the Contractor shall perform the leakage test. The line shall be filled with water and all air removed for the test. The Contractor shall provide a pump to maintain the test pressure for the entire test period.
- b. Test Pressure: Maximum operating pressure as determined by the Engineer but not less than 150 psi unless otherwise noted.
- c. Test Duration: 2 hours.
- d. Allowable Leakage:

1) For 18 foot pipe lengths: $L = \frac{SD(P)^{0.5}}{133,200}$

2) For 20 foot pipe lengths: $L = \frac{SD(P)^{0.5}}{148.000}$

L = allowable leakage
(gallons/hour)

S = length of pipe (feet)

D = diameter of pipe
(inches)

P = specified test pressure
(psig)

- e. Visible Leakage: All leaks evident at the surface shall be repaired and leakage eliminated regardless of the measure total leakage.
- f. Leakage Measurement: The amount of water required to maintain the test pressure is the leakage.
- g. Leakage Repair: Repairs to leaks shall be completed in strict accordance with the pipe manufacturer's written recommendations.

3.04 DISINFECTING POTABLE WATER PIPELINES

- A. General: Before being placed in service, all potable pipelines shall be disinfected by chlorination. Taps for chlorination and sampling shall be uncovered and backfilled by the Contractor as required. The disinfection procedure shall be approved by the Engineer.
- B. Standard: AWWA C651-92, "Standards for Disinfecting Water Mains".
- C. Procedure:
 - 1. Flush all dirty or discolored water from the line and introduce chlorine in approved dosages through a tap at one end while water is being withdrawn at the other end of the line.
 - 2. The chlorine solution shall remain in the pipeline for 24 hours.
 - 3. Following the chlorination period, all treated water shall be flushed from the line and replaced with water from the distribution system.
 - 4. Bacteriological sampling and analysis shall be made in full accordance with AWWA Manual C651-92 and the appropriate FDEP permit. If necessary, the Contractor will be required to rechlorinate.
 - 5. Sampling and analysis shall be done by the Owner.
- D. Approval: The line shall not be placed in service until the requirements of the State and County Public Health Department are met, and the Letter of Clearance is obtained from the Department of Environmental Protection.

END OF SECTION

SECTION 15064

POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: Furnish all labor, materials, equipment, and incidentals required and install and test all polyvinyl chloride (PVC) piping, fittings and appurtenances as shown on the Drawings and specified herein.
- B. General Design: The equipment and materials specified herein is intended to be standard type of polyvinyl chloride (PVC) pipe and cast or ductile iron fittings for use in transporting sewage, sludges, and water.

1.02 QUALITY ASSURANCE

- A. Qualifications: All of the polyvinyl chloride (PVC) pipe and cast or ductile iron fittings shall be furnished by manufacturers who are fully experienced, reputable, and qualified in the manufacture of the materials to be furnished. The pipe and fittings shall be designed, constructed, installed in accordance with the best practices and methods and shall comply with these specifications as applicable.
- B. Standards:
 - 1. AWWA C900/M23 and C905
 - 2. ASTM D1784, ASTM D1785, ASTM D2241, ASTM D2466, ASTM D2564, ASTM D2729, ASTM D2774, ASTM D3034, ASTM D3139, ASTM 3212
 - 3. NSF 14
 - 4. UNI-B-1 through 5
 - 5. ANSI B-16.5
- C. Factory Tests: The manufacturer shall perform the factory tests described in Section 3 – AWWA C900
- D. Quality Control:
 - 1. The manufacturer shall establish the necessary quality control and inspection practice to ensure compliance with the referenced standards.
 - 2. In addition to the manufacturer's quality control procedures, the Owner may select an independent testing laboratory to inspect the material at the foundry for compliance with these specifications. The cost of foundry inspection requested by the Owner will be paid by the Owner.
- E. Equipment Manufacturers: (or equal)
 - 1. JM Eagle
 - 2. CertainTeed
 - 3. CanTex
 - 4. Capco
 - 5. Condux
 - 6. H & W
 - 7. Diamond

1.03 SUBMITTALS

- A. Materials and Shop Drawings: Submit shop drawings to the Engineer in accordance with Section 01340. The location of all pipes shall conform to the Contract Drawings. In some cases, however, a certain amount of flexibility in pipe position will be allowed where new pipes connect to existing piping or when avoiding potential conflicts.
- B. Operating Instructions: Submit Operation and Maintenance Manuals in accordance with Section 01730.
- C. Manufacturer's Certification: Submit sworn certification of factory tests and their results

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Storage: Delivery and storage of the materials shall be in accordance with the manufacturer's recommendations.
- B. Handling: Care shall be taken in loading, transporting, and unloading to prevent damage to the pipe or fittings and their respective coatings. Pipe or fittings shall not be rolled off the carrier or dropped. Unloading shall be done by lifting with a forklift or crane. All pipe or fittings shall be examined before laying, and no piece shall be installed which is found to be defective.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Polyvinyl Chloride (PVC) Pipe:
 - 1. Standards: AWWA C900 and C905/ASTM D1784/ASTM D3034/ASTM D2241
 - 2. Compounds: Class 12454-A or Class 12454-B
 - 3. Dimension Ratio/Thickness:
 - a. Pressure Systems: Potable Water – DR-18
 - 4. Joints:
 - a. Push-on integral bell (nominal diameter 4 inches or larger)
 - 1) Standards: ASTM D3139 and F477/UNI-B-1
 - 2) Gaskets: Flexible elastomeric ring type
 - b. Solvent weld (nominal diameter less than 4 inches)
 - 1) Standards: ASTM D2466/D2564
 - 2) Type: Slip Fitting Socket (tapered)
 - 3) Exclusions: Plastic saddle and flange joints will not be used.
 - c. Pipe Length:
 - 1) Pressure systems: 20 feet maximum nominal length
 - 2) Gravity systems: 13 feet nominal length
- B. Fittings – Pressure Systems (nominal diameter 4 inches or larger)
 - 1. Materials: Ductile or grey cast iron, AWWA C110

2. Joints: Mechanical Joint, minimum 250 psi pressure rating
3. Gaskets: SBR (Styrene Butadine Rubber)
4. Compact Fittings: AWWA C153 (4 – 24 inch diameter only)
5. Exclusions: Standard double bell couplings will no be accepted where the pipe will slip completely through the coupling.

C. Fittings – Pressure Systems (nominal diameter less than 4 inches)

1. Material: Polyvinyl Chloride (PVC)
2. Joints: Slip fitting tapered socket with solvent weld
3. Solvent: Sure Guard 12 or equal
4. Exclusions: Plastic saddle and flange joint fittings will not be used.

2.02 LOCATION MARKINGS AND IDENTIFICATION

A. Location Detection Wire:

1. Materials: Continuous, insulated 10-gauge copper wire
2. Installation: Directly above (1" maximum) centerline of PVC pipe terminating at top of each valve box and be capable of extending 12 inches above top of box in a manner so as not to interfere with valve operation.

B. Identification Markings:

1. Pipe furnished in solid color or white with color lettering as indicated below. For pipes over 12 inch diameter, the pipes shall be solid color.
 - a. Lettering along top 90° of pipe, minimum $\frac{3}{4}$ inch in height with appropriate wording appearing one or more times every 21 inches along the entire length of the pipeline.
 - b. Color: Potable Water – blue

PART 3 – EXECUTION

3.01 INSTALLATION

A. Standards: AWWA C900 and C905/UNI-B-3 and 4

B. Underground Polyvinyl Chloride (PVC) Pipe and Fittings:

1. Bedding: Firm, dry and even bearing of suitable material. Blocking under the pipe will not be permitted.
2. Placement/Alignment: In accordance with lines and grades shown on Drawings. For pressure systems, deflection of joints shall not exceed 75 percent of maximum limits recommended by the manufacturer and as set forth in applicable AWWA standards.
3. Cutting: When required, cutting shall be done leaving a smooth cut at right angles to the axis of the pipe. Cut ends of the pipe to be used with a push-on bell shall be beveled.
4. Joints:
 - a. Placement:

1. Push-on Joints: Pipe shall be laid with the bell ends facing upstream. The gasket shall be inserted, and the joint surfaces cleaned and lubricated prior to placement of the pipe. After joining the pipe, a metal feeler shall be used to verify the gasket is correctly located.
 2. Mechanical Joints: Pipe and fittings shall be installed in accordance with the "Notes on Method of Installation" under ANSI A21.11/AWWA C111. The gasket shall be inserted and the joint surfaces cleaned and lubricated with soapy water before tightening the bolts to the specified torque.
- C. Thrust Restraint: Thrust restraint for PVC pipes shall be by mechanical restraining devices for PVC as manufactured by JCM 610 Suregrip, Romac Grip ring (611, 612, 613) EBAA (2000 series, 1500 series, and 2800 series) or equal.

3.02 CLEANING

- A. General: At the conclusion of the work, the Contractor shall thoroughly clean the new pipe lines by flushing with water or other means to remove all dirt, stones or other material which may have entered the line during the construction period.
- B. Correction of Non-Conforming Work: Non-conforming work shall be defined as failure to adhere to any specific or implied directive of this Project Manual and/or the drawings, including but not limited to pipe not laid straight, not true to the lines and grades as shown on the drawings, damaged or unacceptable materials, misalignment or diameter ring deflection in pipe due to bedding or backfilling, visible or detectable leakage and failure to pass any specified test or inspection. All non-conforming work shall be repaired or replaced by the Contractor at no additional expense to the Owner.

3.03 FIELD TESTING

- A. General: At least ten (10) days prior to beginning testing, the Contractor shall submit a testing plan to the Engineer for review.
- B. Pressure Piping:
1. General: The Contractor shall perform hydrostatic pressure and leakage tests on all pressure piping.
 2. Standard: AWWA C600, Section 4, with the exceptions required herein and the exception the Contractor shall furnish all gauges, meters, pressure pumps and other equipment needed to test the lines.
 3. Hydrostatic Pressure Test:
 - a. Test Pressure: 50 percent above the normal working pressure, but not less than 150 psi, unless otherwise noted on the Drawings.
 - b. Test Duration: 24 hours
 - c. Air Release: Corporation cocks at least $\frac{3}{4}$ inch in diameter, pipe riser, and angle globe valves shall be provided at each dead-end to bleed air from the line.
 4. Hydrostatic Leakage Test:
 - a. General: Following the pressure test, the Contractor shall perform the leakage test. The line shall be filled with water and all air removed for the test. The Contractor shall provide a pump to maintain the test pressure for the entire test period.

- b. Test Pressure: Maximum operating pressure as determined by the Engineer but not less than 150 psi unless otherwise noted.
- c. Test Duration: 2 hours.
- d. Allowable Leakage:
 - 1. For 18 foot pipe lengths: $L = \frac{SD(P)^{0.5}}{133,200}$
 - 2. For 20 foot pipe lengths: $L = \frac{SD(P)^{0.5}}{148,000}$

L = allowable leakage
(gallons/hour)

S = length of pipe (feet)

D = diameter of pipe
(inches)

P = specified test pressure
(psig)
- e. Visible Leakage: All leaks evident at the surface shall be repaired and leakage eliminated regardless of the measure total leakage.
- f. Leakage Measurement: The amount of water required to maintain the test pressure is the leakage.
- g. Leakage Repair: Repairs to leaks shall be completed in strict accordance with the pipe manufacturer's written recommendations.

3.04 DISINFECTING POTABLE WATER PIPELINES

- A. General: Before being placed in service, all potable pipelines shall be disinfected by chlorination. Taps for chlorination and sampling shall be uncovered and backfilled by the Contractor as required. The disinfection procedure shall be approved by the Engineer.
- B. Standard: AWWA C651-92, "Standards for Disinfecting Water Mains".
- C. Procedure:
 - a. Flush all dirty or discolored water from the line and introduce chlorine in approved dosages through a tap at one end while water is being withdrawn at the other end of the line.
 - b. The chlorine solution shall remain in the pipeline for 24 hours.
 - c. Following the chlorination period, all treated water shall be flushed from the line and replaced with water from the distribution system.
 - d. Bacteriological sampling and analysis shall be made in full accordance with AWWA Manual C651-92 and the appropriate FDEP permit. If necessary, the Contractor will be required to rechlorinate.
 - e. Sampling and analysis shall be done by the Owner.
- D. Approval: The line shall not be placed in service until the requirements of the State and County Public Health Department are met, and the Letter of Clearance is obtained from the Department of Environmental Protection.

END OF SECTION

SECTION 15071

HIGH DENSITY POLYETHYLENE (HDPE) PIPE AND FITTINGS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. Furnish all labor, materials, equipment, and incidentals required and install and test all high-density polyethylene (HDPE) piping, fittings and appurtenances as shown on the Drawings and specified herein. This section includes materials and testing of PE 4710 high density, very high molecular weight polyethylene pipe and fittings of sizes up to 24 inches for use in so-called "trenchless" installation and selected services and having a hydrostatic design basis of 1,600 psi at an operating temperature of 74°F. Pipe diameter basis is cast iron equivalent outside diameter (OD) with standard dimension ratio (SDR) and pressure class as specified herein.

B. General Design:

1. The equipment and materials specified herein is intended to be standard types of high density polyethylene (HDPE) pipe and fittings for use in transporting sewage, sludges, reclaimed and potable water.

- C. The location of all pipes shall conform to the Contract Drawings. In some cases, however, a certain amount of flexibility in pipe position will be allowed where new pipes connect to existing piping or when avoiding potential conflicts.

1.02 QUALITY ASSURANCE

A. Qualifications:

1. All the high-density polyethylene (HDPE) pipe and fittings shall be furnished by manufacturers who are fully experienced, reputable, and qualified in the manufacture of the materials to be furnished. The pipe shall be extruded from pre-compounded resin. In-plant blending of resin is unacceptable. The pipe and fittings shall be designed, constructed, installed in accordance with the best practices and methods and shall comply with these specifications as applicable.

B. Standards:

1. AWWA C901 (pipe ½ inch – 3 inches)
2. AWWA C906 (pipe 4 inches and larger)
3. NSF Standard 14
4. NSF Standard 61

C. Factory Test:

1. The manufacturer shall perform the factory tests described in Section 4 – AWWA C906.

D. Quality Control:

1. The manufacturer shall establish the necessary quality control and inspection practice to ensure compliance with the referenced standards.

2. In addition to the manufacturer's quality control procedures, the Owner may select an independent testing laboratory to inspect the material at the foundry for compliance with these specifications. The cost of foundry inspection requested by the Owner will be paid for by the Owner.

1.03 SUBMITTALS

A. Materials and Shop Drawings:

1. Submit shop drawings to the Engineer in accordance with the conditions of the Contract and Section 01340. Submit manufacturer's recommended methods for butt-fusing joints and connections between dissimilar materials.

B. Operating Instructions:

1. Submit Operation and Maintenance Manuals in accordance with Section 01730.

C. Manufacturer's Certification:

1. The polyethylene pipe manufacturer shall provide certification that stress regression testing has been performed on the specific product. Certification shall include a stress life curve per ASTM 2837.
2. Provide certification that the material is listed by the Plastic Pipe Institute in PPI TR-4 with 73° F. Hydrostatic design stress rating of 800 psi. The PPI listing shall be in the name of the pipe manufacturer and shall be based on ASTM D3350 and PPI TR-3 testing and validation of samples of the pipe manufacturer's production pipe.
3. The manufacturer's certification shall state the pipe was manufactured from one specific resin in compliance with these specifications. The certificate shall state the specific resin used, its source, and list its compliance to these specifications.
4. Submit certified lab data to verify specified physical properties. Certify tests are representative of pipe supplied for this project.
5. Submit affidavit of compliance with referenced standards (e.g., AWWA C901, C906, etc.).
6. Submit qualification certificates for operators of the heat fusion equipment.
7. Submit schedule for placement of and removal of test bulkheads.
8. Submit certification that materials intended to contact portable water are listed under NSF 61.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Storage: Delivery and storage of the materials shall be in accordance with the manufacturer's recommendations.
- B. Inspection: All materials furnished are subject to inspection by the Owner.
- C. Handling: Care shall be taken in loading, transporting, and unloading to prevent damage to the pipe or fittings and their respective coatings. Pipe or fittings shall not be rolled off the carrier or dropped. Unloading shall be done by lifting with a forklift or crane. All pipe or fittings shall be examined before laying, and no piece shall be installed which is found to be defective.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. High density polyethylene (HDPE) pipe:

1. Standards: ASTM D3350/AWWA C901 & C906
2. Dimension Ratio: Pipe shall have a nominal iron pipe size (IPS) OD with minimum standard dimension ratio of SDR 11.
3. Pressure Class Rating: Pipe shall have a minimum Pressure class 160 for water mains and 100 for force mains with hydrostatic design basis (HDB) of 1,600 psi, as determined in accordance with ASTM D2837.
4. Pipe Materials: Materials used for the manufacture of polyethylene pipe and fitting shall be very high molecular weight, high density ethylene/hexene copolymer PE 4710 polyethylene resin.

B. Fittings:

1. Materials: Fittings shall be made from material meeting the same requirements as the pipe. Fittings shall be fabricated by the manufacturer of the pipe.
2. Fittings shall meet the appropriate AWWA Standard for the size involved (C901 or C906).
3. Molded fittings shall be manufactured in accordance with ASTM C3261 and shall be so marked.
4. Mechanical fittings, when used, shall be specifically designed for, or tested, and found to be acceptable for use with HDPE pipe.
5. Fittings used to connect with dissimilar pipe materials shall be provided as per the manufacturer.

C. Joints:

1. Sections of polyethylene pipe shall be fused into continuous length on the job site above ground. The joining method shall be the butt-fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The butt-fusion equipment used in the joining procedures shall be capable of meeting all conditions recommended by the pipe manufacturer.
2. Butt-fusion foiling shall result in joint weld strength equal to or greater than the tensile strength of the pipe. Socked fusion shall not be used. Flanges, unions, grooved couplers, transition fittings, and some mechanical couplers may be used to connect HDPE pipe mechanically without butt fusion only where shown in the drawings.

D. Nipples and Flanged Stub Ends:

1. Short nipples and stub end shall be the same material as the HDPE.

2.02 LOCATION WIRE AND IDENTIFICATION MARKINGS

A. Location Detection Wire:

1. Materials: Continuous, insulated 10-gauge copper wire
2. Installation: Directly above (1" maximum) centerline of PVC pipe terminating at top of each valve box and be capable of extending 12 inches above top of box in a manner so as not to interfere with valve operation.

B. Identification Markings:

1. Pipe furnished in solid color or black/grey with color stripe or color lettering as indicated below.
 - a. Stripe shall be continuous along the top 90° of pipe, minimum 2 inch in width. Lettering along top 90° of pipe, minimum ¾ in height with appropriate working appearing one or more times every 21 inches along the entire length of the pipeline.

PART 3 – EXECUTION

3.01 QUALIFICATION OF FUSION OPERATORS

- A. Each operator performing fusion joining shall be qualified in the use of the manufacturer's recommended fusion procedure(s) by the following:
1. Appropriate training or experience in the use of the fusion equipment and procedure.
 2. Making a sample joint according to the procedure that passes the following inspections and tests:
 - a. The joint shall be visually examined during and after joining and found to have the same appearance as a photograph or sample of an acceptable joint that was joined in accordance with the manufacturer's procedure.
 - b. The joint shall be tested or examined by one of the following methods:
 - 1) Pressure and tensile as described in 49 CFR 192.283.
 - 2) Ultrasonic inspection and found to be free of flaws that would cause failure.
 - 3) Cut into at least three longitudinal straps, each of which is:
 - a) Visually examined and found to be free of voids or unbonded areas on the cut surface of the joint.
 - b) Deformed bending, torque, or impact and if failure occurs, it must not initiate in the joint area.
 - c. Each operator shall be requalified under the procedure, if, during any 12-month period, he:
 - 1) Does not make any joints under the procedure
 - 2) Has three joints or three percent of the joints he has made, whichever is greater, that are found unacceptable by testing under 49 CFR 192.5 13

3.02 DELIVERY AND TEMPORARY STORAGE OF PIPE AT SITE

- A. Transport individual pipe lengths to the job site on padded bonds with nylon tie down straps or padded bonding to protect the pipe. Coiled HDPE pipe shall be stored in a manner to ensure safety. Protect the pipe from sharp objects. Anchor pipe securely to prevent slippage.
- B. Store individual pipe lengths on earth beams or timber cradles in the numerical order of installation. Stack the heaviest series of pipe at the bottom. Do not stack pipe in excess of 20 rows high.
- C. Protect the pipe from stones and sharp objects.
- D. Store fitting in their original cartons.

3.03 HANDLING OF PIPES

- A. Lift pipes with handling beams or wide belt slings near the middle of joints as recommended by the pipe manufacturer. Do not use cable slings, chains, or hooks.
- B. Before installation, check pipe and fittings for cuts, scratched, gouges, buckling, kinking, or splitting. Remove any pipe section containing defects by cutting out the damaged section in a complete cylinder.

3.04 SANITATION OF PIPE INTERIOR

- A. During fusion operations and laying operations, do not place tools, clothing, or other materials in the pipe.
- B. When pipe laying is not in progress, including the noon hour, close the ends of the pipe by a vermin proof plug.

3.05 HEAT FUSION

- A. Use fusion equipment specially designed for heat fusion of HDPE such as offered by McElroy Manufacturing, Inc. Tulsa, Oklahoma or approved equal. The equipment utilized shall be regulated for the different melt strength materials. Compatibility fusion techniques shall be used when polyethylene of different melt indexes are fused together.
- B. Use the following procedure to butt-fuse HDPE pipe. If an operation contradicts Manufacturer's directions, follow the manufacturer's recommendation:
 - 1. Maintain the proper temperature of the heater plate as recommended by the pipe manufacturer. Check it with tempilstik or pyrometer for correct surface temperature.
 - 2. Clean pipe ends inside and outside with a clean cotton cloth to remove dirt, water, grease, and other foreign materials.
 - 3. Square (face) the pipe ends using facing tools of the fusion machine. Remove all burns, chips and fillings before joining pipe or fittings.
 - 4. Check line-up of pipe ends in fusion machine to see that pipe ends meet squarely and completely over the entire surface to be fused. Make sure the clamps are tight so the pipe does not slip during fusion process.
 - 5. Insert clean heater plate between aligned ends and bring ends firmly in contact with plate but do not apply pressure while achieving melt pattern. Allow pipe ends to heat and soften.
 - 6. Carefully move the pipe ends away from the heater plate and remove the plate (if the softened materials stick to the heater plate, discontinue the joint, clean heater plate, resquare pipe ends, and start over).
 - 7. Bring melted ends together rapidly. Do not slam. Apply enough pressure to form a double roll-back bead to the body of the pipe around the entire circumference of the pipe about 1/8 inch to 3/16 inch wide. Pressure is necessary to cause the heated material to flow together.
 - 8. Allow the joint to cool and solidify properly. Remove the pipe from the clamps and inspect the joint appearance.

3.06 SIDEWALL FUSION

- A. Side fusion procedure for HDPE shall be accomplished in the field using 2 inch through 12 inch McElroy (or approved equal) fusion units and proper heater plate adapters. When branch outlets are larger than 12 inches in outside diameter, sidewall fusion shall be accomplished in a fitting fabrication shop.
- B. Use the following procedure to side fuse the HDPE pipe. If an operation contradicts manufacturer's directions, follow manufacturer's recommendation. Clean the pipe with a cotton cloth.
 - 1. Prepare surface of the pipe (main) by roughing with 60 grit or coarser utility cloth.
 - 2. Prepare the base of the branch by roughing with 60 grit or coarser utility cloth.
 - 3. Align branch on the main and tighten clamp.

4. Check branch for square alignment on main.
5. Retract moveable clamp, roll in, and center heater plat with adapter between base branch and main.
6. For all sizes, apply a strong, firm, continuous pressure until complete melt bead can be seen on main. Release pressure to light pressure. Continue heat soak cycle on branch and main. Watch base of branch for:

<u>Main Sizes (inches)</u>	<u>Heat Soak Cycle Fitting Base Bead</u>
2	1/8 inch Melt Bead
3 and larger	1/8 to 3/16 inch Melt Bead

7. Retract movable clamp and cleanly remove heater plate.
8. Bring melted surfaces together rapidly. Do not slam. Apply continuous progressive pressure until proper fusion bead is formed. Maintain pressure until joint has cooled

3.07 OPERATIONS INCIDENTAL TO JOINT COMPLETION

- A. Install identification wire where detailed in the Drawings.
- B. Plan joint completion to accommodate temporary test bulkheads for hydrostatic testing on the day of installation.

3.08 CONNECTIONS

- A. Mechanical joining to other piping materials (fittings, valves, tanks, pumps, etc.) shall be accomplished as follows:
 1. Ductile Iron to HDPE Connections:
 - a. Connections between ductile iron pipe or fittings and PVC pipe or fitting shall use flange to flange or ductile iron mechanical joint glands conforming to AWWA C111 and AWWA C153. Gaskets, bolts, and hexagonal nuts shall be standard rubber gaskets confirming to AWWA C111. Follower gland shall match class 350 compact fittings.
 - b. An HDD flange adaptor with backing rings or HDPE mechanical joint adaptor shall be provided for the specific connection.
 - c. HDPE pipe stiffeners shall be constructed of stainless steel and shall be flanged on one end to prevent over-insertion into the receiving pipe.
 - d. Install mechanic joints in accordance with AWWA C600 and manufacturer's recommendations.
 - e. When connection is being made to HDPE pipe or fitting, insert pipe stiffener into connection end of HDPE pipe until flared end seats against cut face.
 - f. All connections to same or different materials shall be restrained. Mechanical joint restraints shall be wedge type megalug or similar.
 2. PVC to HDPE Connections:
 - a. The joining end of the HDPE pipe shall have a butt-fused flange piece attached in accordance with manufacture's recommendations.

- b. Connection to PVC shall use a fully restrained ductile iron mechanical joint confirming to the requirements of AWWA C111 to C153.
 - c. Butt-fuse flange piece to connection end of HDPE pipe in accordance with manufacturer's recommendation.
 - d. Install fully restrained mechanical joint on PVC connection end in accordance with AWWA C600 and manufacturer's recommendation.
- B. Flange adapters shall be pressure rated the same as the pipe. Flange adapters shall be heat fused to the pipe as outlined in the heat fusion section.
- C. Gaskets shall be used between the polyethylene flange adapters when recommended by the HDPE pipe manufacturer. Sufficient torque shall be applied evenly to the bolts to prevent leaks. After initial installation and tightening of flanged connections, allow the connections to set for a few hours. Then conduct a final tightening of the bolts.
- D. Lubricate nuts and bolts with oil or graphite prior to installation. Check operation of valves connected to molded stub end flange adapters. Insert polyethylene spacer if recommended by pipe manufacturer for clearance.

3.09 CLEANING AND FIELD TESTING

- A. General:
 - 1. At the conclusion of the Work, the Contractor shall provide all associated cleaning and field testing as specified in associated section of these specifications.
- B. Pressure Testing:
 - 1. Pressure testing of polyethylene piping shall be in accordance with the following standards:
 - a. AWWA Manual M55 and the Plastic Pipe Institute, Handbook of Polyethylene Pipe.

END OF SECTION

SECTION 15100

VALVES AND APPURTENANCES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: Furnish, install, support, and test valves, gates, hydrants, strainers, stops, and faucets, (hereinafter referred to as "valves") in the location(s) and of the size(s) and quantities shown on the Drawings. The requirements of this specification apply to all valves specified.
- B. General Design:
1. All the equipment and materials specified herein are intended to be standard for use in controlling the flow of sewage, water, sludge, chemicals, air, etc., depending on the applications.
 2. All valves and appurtenances shall have the name of the manufacturer and the working pressure for which they are designed cast in raised letters upon some appropriate part of the body.
 3. For all buried valves in which the operating nut is deeper than four (4) feet from the finish ground surface, an extension rod with 2 inch operating nut and upper guide shall be installed permanently in the riser section.
 4. All exposed valves shall have "open/closed" position indicators. The position indicators shall be conveniently located for easy visibility. Valves shall open counter clockwise.
 5. All valves installed such that actuators are more than six feet above the floor shall have chain wheel operated geared actuators with stainless steel chains. Gear actuators shall be bevel or spur gear as recommended by the manufacturer.
 6. All exposed valves 6 inches and larger shall be handwheel operated.
 7. Valve packing shall be replaceable without removing the valve from service.

1.02 QUALITY ASSURANCE

- A. Qualifications:
1. All equipment furnished under this Specification shall be new and unused and shall be a standard product which has a successful record of reliable service in similar installations for a minimum of five (5) years.
 2. All valves of same type and duty shall be furnished by a single manufacturer.
- B. Standards:
1. ANSI
 2. AISI
 3. AWWA
 4. SSPC
- C. Warranty: Provide manufacturer's warranty in accordance with the General Conditions and Division 1.
- D. Equipment Manufacturers:
1. Equipment manufacturers are named in each individual valve specification.
 2. The naming or reference to a specific manufacturer does not indicate the manufacturer's standard equipment is acceptable in lieu of the specified component features. This reference is only an indication the named manufacturers may have the capability of supplying the specified equipment.

1.03 SUBMITTALS

- A. Materials and Shop Drawings: Copies of all materials required to establish compliance with the Specification shall be submitted in accordance with the provisions of the General Conditions and Division 1. Submittals shall include at least the following:
1. Certified shop drawings showing all important details of construction, dimensions (including laying length), and weight.
 2. Descriptive literature, bulletins, and/or catalogs showing all valve parts, and describing material of construction by material and specification, e.g., AISI.
 3. Schedule of valves, referencing each valve type, end connections and actuators to the proposed location/application on the Drawings.
 4. Valve coatings and linings, if any.
 5. Valve Tag Identification Schedule (see PART 2)
 6. See individual sections for additional requirements.
- B. Operation and Maintenance Manuals: For all valves furnished under this Section, the Contractor shall submit operation and maintenance manuals in accordance with Division 1, to include the following:
1. Equipment function
 2. Description
 3. Normal and limiting operating characteristics
 4. Installation instructions (assembly, alignment, and adjustment procedures).
 5. Operation instructions (normal start-up and shut-down procedures, normal operating conditions, and emergency situations.
 6. Lubrication and maintenance instructions
 7. Troubleshooting guide
 8. Parts list and predicted life of parts subject to wear.
 9. Drawings – cross-sectional view, assembly diagrams

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Delivery of Materials and Equipment:
1. 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.
 2. Factory assembled parts and components shall not be dismantled for shipment unless permission is received in writing from the Engineer.
 3. Finished surfaces of all exposed openings shall be protected by wooden blanks; strongly built and securely bolted thereto.
 4. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.

5. After hydrostatic or other tests, all entrapped water shall be drained prior to shipment, and proper care shall be taken to protect parts from the entrance of water during shipment, storage, and handling.
6. Each box or package shall be properly marked to show its net weight in addition to its contents.

B. Storage of Materials and Equipment:

1. Store valves and accessories in an area on the construction site protected from weather, moisture, or possible damage.
2. Do not store valves and accessories directly on the ground or in the open.

C. Handling of Materials and Equipment:

1. Handle valves and accessories to prevent damage of any nature.
2. Carefully inspect all materials for:
 - a. Defects in workmanship and materials.
 - b. Removal of debris and foreign material in valve openings and seats.
 - c. Proper functioning of all operating mechanisms
 - d. Tightness of all nuts and bolts

1.05 SPECIAL TOOLS AND SPARE PARTS

A. Special Tools:

1. All special tools required for normal operation and maintenance shall be provided in accordance with Division 1.
2. One (1) each tee handle operator shall be provided for every three (3) buried valves.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Materials shall be as indicated in specific sections, or on the Drawings, and compatible with intended use.
- B. Valves shall have the name of the manufacturer and the size of the valve cast or molded onto the valve body or bonnet or shown on a permanently attached stainless steel plate.
- C. Bolts, washers, nuts, and gaskets for flanged valves shall be as described in the specific piping sections.
- D. Coat metal valves located above ground or in vaults and structures the same as the adjacent piping. Apply the specified prime coat at the place of manufacture. Apply finish coat in field. Finish coat shall match the color of the adjacent piping. All prime and finish coats shall be in compliance with Division 9

2.02 VALVE IDENTIFICATION

- A. On all valves except shut-off valves located at a fixture or piece of equipment, the Contractor shall provide a coded and numbered tag attached with brass chain and/or brass "S" hooks.
 1. Tag types:

- a. Tags for valves on pipe and tube lines conducting hot medium (steam, condensate, hot water, air, etc.) shall be brass or anodized aluminum.
 - b. Tags for all other valves shall be color plastic.
 - c. Colors for aluminum and plastic tags shall, where possible, match the color code of the pipe line on which installed.
 - d. Square tags shall be used to indicate normally closed valves and round tags shall indicate normally open valves.
- 2. Coding: In addition to the color coding, each tag shall be stamped or engraved with wording or abbreviations to indicate the line service. All color and letter coding shall be approved by the Engineer.
 - 3. Manufacture: Tags shall be as manufactured by Seton Name Plate Corporation, Floy Tag & Manufacturing Co. or approved equal
 - 4. Valve Schedule: The Contractor shall provide a typed list of all tagged valves giving tag color, shape, letter code and number, the valve size, type, use and general location within building.

2.03 VALVE BOXES

- A. Valve boxes shall be provided for all buried valves. Valve boxes shall be one complete assembled unit composed of the valve box and extension stem. All moving parts of the extension stem shall be enclosed in a housing to prevent contact with the soil. Valve box assembly shall be adjustable to accommodate variable trench depths.
- B. The entire assembly shall be made of minimum ¼ inch heavy wall high density polyethylene. All components shall be joined with a permanent locking design. The valve box top section shall be adaptable to fit inside a standard valve box upper section.
 - 1. The stem assembly shall be of a telescoping design that allows for variable adjustment length. The material shall be galvanized steel square tubing. The stem assembly shall have a built-in device that keeps the stem assembly from disengaging at its fully extended length. The extension stem must be torque tested to 1,000-foot pounds. Valve box shall be American Flow Control's Trench Adaptor or equal.
- C. Valve Boxes shall be equipped with a concrete valve pad with bronze valve marker as detailed on the Plans.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install valves and accessories in strict accordance with manufacturer's instructions and recommendations, as shown on the Drawings and/or as directed by the Engineer.
- B. Carefully erect all valves and support them in their respective positions free from distortion and strain.
- C. Bolt holes of flanged valves shall straddle the horizontal and vertical centerlines of the pipe run to which the valves are attached. Clean flanges by wire brushing before installing flanged valves. Clean flange bolts and nuts by wire brushing, lubricate threads with oil and graphite, and tighten nuts uniformly and progressively. Clean threaded joints by wire brushing or swabbing. Apply Teflon joint compound or Teflon tape to pipe threads before installing threaded valves. Joints shall be watertight.
- D. Support all valves connected to pumps and equipment, and in piping systems that cannot support valves.

- E. Repair any scratches, marks, and other types of surface damages, etc., with original prime coating as supply by the factory.

3.02 INSPECTION AND TESTING

- A. Check and adjust all valves and accessories for smooth operation.
- B. Test valves for leakage while the connecting pipelines are tested. Protect or isolate any parts of valves, operators, or control and instrumentation systems whose pressure rating is less than the pressure tests.
- C. If flanges leak under pressure testing, loosen or remove the nuts and bolts, reseal or replace the gasket, reinstall or retighten the bolts and nuts, and retest the joints.

END OF SECTION

SECTION 15101

GATE VALVES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: Furnish and install gate valves of the type and size and in the location as shown on the Drawings and/or specified herein.
- B. General Design:
 - 1. 1 ½ inch and smaller above ground: 125 bronze.
 - 2. 2 inches and larger, above ground: iron body, bronze mounted, non-rising stem (NRS)
 - 3. Below ground: iron body, bronze mounted, NRS. Use reducers as necessary to accommodate small, buried piping.
 - 4. Comply with the requirements of Section 15100.

1.02 QUALITY ASSURANCE

- A. Qualifications: See Section 15100
- B. Standards: See Section 15100
- C. Warranty: See Section 15100
- D. Equipment Manufacturers:
 - 1. General Service: 1 ½ inch and smaller, above ground
 - a. Mueller Valve Company
 - b. American Flow Control
 - c. Or equal
 - 2. General Service NRS: 2 – 12 inches
 - a. Mueller Valve Company
 - b. American Flow Control
 - c. Or equal

1.03 SUBMITTALS

- A. General: Submittals shall be in accordance with Section 15100

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. General: Product delivery, storage, and handling shall be in accordance with Section 15100

1.05 SPECIAL TOOLS AND SPARE PARTS

- A. General: Provide special tools in accordance with Section 15100

PART 2 – PRODUCTS

2.01 GENERAL

- A. General: Valves shall comply with PART 2 – Products of Section 15100

2.02 ACCESSORIES

A. General Service 2 inch and smaller above ground:

1. Bronze construction – 125lb steam
2. Union bonnet
3. Inside screw, rising stem or non-rising stem
4. Solid disc, taper wedge
5. End connections:
 - a. Threaded
 - b. Solder ends for copper pipe systems
6. Malleable iron, or steel hand wheel

B. General Service – 2 ½ inch to 30 inches

1. Ductile iron body, bonnet and bonnet cover, ASTM A536, 200 psi working pressure.
2. Non-rising stem, made of cast, forged, or rolled bronze.
3. Ductile iron gate with vulcanized EPDM synthetic rubber coating (resilient seated). Zero leakage at 200 psi.
4. Valves for buried service shall have mechanical joints conforming to ANSI A-21.11, above ground service joints shall be flanged conforming to ANSI B-16.1 for Class 125 flanges.
5. All ferrous surface inside and outside shall have a fusion-bonded epoxy coating.

C. General Service – Greater than 30 inches: Valves shall meet the requirements of 2.01 and 2.02.B except as specified otherwise below:

1. Operator shall be bevel or spur geared.
2. In horizontal installations, valves shall be equipped with bevel gear suitable for buried service.
3. Valves 42 inches and greater shall be provided with by-pass gate valve.
4. Working pressure shall be a minimum of 150 psi.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install valves with stem position vertical, unless shown otherwise.
- B. Allow sufficient clearance around valve operator for proper operation.
- C. Install in accordance with "Valve and Appurtenances - General" Section 15100.

END OF SECTION

SECTION 15116

VALVE BOXES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: Furnish and install valve boxes of type and size and in the location shown on the Drawings and as specified herein.

1.02 QUALITY ASSURANCE

- A. Qualifications: See Section 15100
- B. Standards: All curb boxes shall be the product of one manufacturer.
- C. Warranty: See Section 15100
- D. Equipment Manufacturers:
 - 1. Tyler 461S (18 – 24 inch) Tyler 562S (25 – 36 inch)
 - 2. Or equal

PART 2 – PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. All buried valves shall have cast iron, two (2) piece valve boxes. Valve boxes shall be provided with suitable heavy bonnets and to extend to such elevation at or slightly above the finished grade surface as directed by the Engineer.
- B. The barrel shall be screw type, having 5-1/4 inch diameter shaft. The lower section shall have a flange at the bottom having sufficient bearing area to prevent settling and shall be complete with cast iron covers.
- C. Covers shall have "WATER" cast into the top for all water mains and "SEWER" cast into the top of all wastewater force mains and "REUSE" cast into the top of all reclaimed water mains.
- D. All valves shall have actuating nuts extended to top of valve boxes. Valve boxes shall be provided with concrete base and valve nameplate as detailed on the Drawings

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install as shown on the Drawings and/or as directed by the Engineer.
- B. When installation is complete, no pressure shall be exerted by the valve box on either the valve or the pipe.

END OF SECTION

SECTION 15118

BACKFLOW PREVENTION DEVICE

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: Furnish and install a backflow prevention device of the type, size, and capacity and in the location shown on the Drawings and as specified herein.
- B. General Design: Comply with the requirements of Section 15100

1.02 QUALITY ASSURANCE

- A. Qualifications: See Section 15100
- B. Standards: See Section 15100
- C. Warranty: See Section 15100
- D. Equipment Manufacturers:
 - 1. FEBCO
 - 2. Watts
 - 3. Or equal

1.03 SUBMITTALS

- A. General: Submittals be in accordance with Section 15100

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. General: Product delivery, storage, and handling shall be in accordance with Section 15100

1.05 WARRANTY AND GUARANTEES

- A. General: Provide special tools in accordance with Section 15100

PART 2 – PRODUCTS

2.01 MATERIALS

- A. General: Valve shall comply with Section 15100
- B. The main valve body shall be cast iron with epoxy coated interior, main valve trim shall be bronze ASTM B-61 and stainless steel 316.

2.02 ACCESSORIES

- A. General: Valve shall comply with Section 15100
- B. Reduced Pressure Backflow Preventer:
 - 1. Backflow preventers shall be of reduced pressure type with two (2) independently operating check valves.

2. An independent pressure relief valve shall be located between the two check valves.
3. The unit shall include tightly closing shut-off valves located at each end of the device and shall be fitted with properly located test cocks.
4. All internal parts of the check valves and pressure relief valve must be removable or replaceable without removal of the unit from the line.
5. The total head loss through the complete backflow assembly shall not exceed 12 psi as the rated flow of 120 gpm.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install in accordance with Section 15100, the manufacturer's recommendations and as indicated on the Drawings.
- B. Check-Out and Demonstration testing shall be provided in accordance with Division 1.

END OF SECTION

SECTION 15120

PIPING SPECIALTIES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: This section includes materials and installation of the miscellaneous piping specialties.
- B. General Design:
 - 1. Comply with Section 15100, Article 1.01.B.1, 2 and 3
 - 2. Specialties shall have a working pressure rating equal to or greater than the piping installed in.

1.02 QUALITY ASSURANCE

- A. Qualifications: See Section 15100
- B. Standards: See Section 15100
- C. Warranty: See Section 15100
- D. Equipment Manufacturers: See PART 2

1.03 SUBMITTALS

- A. General: Submittals must be in accordance with Section 15100

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. General: Product delivery, storage, and handling shall be in accordance with Section 15100

1.05 SPECIAL TOOLS AND SPARE PARTS

- A. General: Provide special tools in accordance with Section 15100

PART 2 – PRODUCTS

2.01 TAPPING SLEEVES AND VALVES

- A. Mechanical joint tapping sleeves shall be cast of gray-iron or ductile-iron and have an outlet flange with the dimensions of the Class 125 flanges shown in ANSI B16.1, properly recessed for tapping valve. Glands shall be gray-iron or ductile iron. Gaskets shall be vulcanized natural or synthetic rubber. Bolts and nuts shall comply with ANSI A-21.11/AWWA C111. Sleeves shall be capable of withstanding a 200 psi working pressure. Mechanical joint tapping sleeves shall be JCM 432, TPS Triple Tap, TPS T3 Saddle, or approved equal.
- B. Tapping valves shall be resilient seat gate valves, and the end configuration shall be compatible with the tapping sleeve.

2.02 SERVICE SADDLES, CORPORATION STOPS, CURB STOPS, AND SERVICE LINES

- A. Service saddles shall have ductile iron bodies in accordance with ASTM A536, latest revision, with double stainless steel straps. Ductile iron body shall have a fusion bonded nylon coating with a minimum thickness of 12 mils. Straps shall be Type 316 stainless steel with premium grade Type 316 L stainless steel bolts and Type 316 stainless steel washers and nuts. The nuts shall be Teflon coated. The gasket

material shall be an elastomeric compound resistant to degradation by oil, natural gas, acids, alkalis, most aliphatic fluids, and chloramines. Service saddles shall be rated for a working pressure of at least 200 psi. The outlet of the saddle shall have AWWA tapered threads for corporation stops or IP threads for gate valves. Service saddles shall be manufactured by Rockwell, Ford, Smith-Blair or an approved equal.

- B. Corporation stops shall be designed and manufactured in accordance with AWWA C800, latest edition. Inlet threads shall be AWWA taper thread (CC). Outlet shall be fitted with connections to suit connecting pipe or tube. Provide insert stiffeners for plastic tubing and PE pipe. Corporation stops shall be manufactured by Mueller, Ford Meter Box Company, or an approved equal.
- C. Curb stops shall be constructed of bronze conforming to ASTM B-62/AWWA C800. Seats and O-rings shall be of Buna-N rubber. Inlet and outlet connections shall be compatible with adjacent pipe, tubing, yokes, or meters as applicable. Insert stiffeners shall be provided for plastic tubing and polyethylene pipe. Curb stops shall be Mueller Oriscal III, Ford Ball Valve Curb Stops, or an approved equal.
- D. Potable water service lines shall be polyethylene tubing conforming to AWWA C800 and AWWA C901. Tubing shall be rated for a working pressure of 200 psi.

2.03 PVC BALL AND CHECK VALVES

- A. All PVC ball valves ½ inch through 4-inch in size shall be of one piece capsule type manufactured of Type 1, Grade 1 PVC. Ball valves shall be true union design with two-way blocking capability and shall have solvent welded socket or NPT threaded ends.
- B. Ball valves shall be supplied with ABS lever operating handles. All PVC ball check valves shall have Teflon seats and Viton O-ring seals, and shall be designed for a 150 psi water working pressure at 120°F.
- C. PVC ball check valves shall be of Type 1 Grade 1 PVC and shall have union ends on both sides of the valves. Ball check valves shall be rated for a working pressure of 150 psi at 120° F.
- D. All PVC ball valves and ball check valves shall be manufactured by Asahi/America, Celanese Piping Systems, Inc., Chemtrol, Plastiline, Inc., or an equal approved by the Engineer.

2.04 STAINLESS STEEL BALL VALVES

- A. Stainless steel ball valves shall be standard port type for the sizes indicated on the Drawings. Ball valves shall be designed for a working pressure of 200 psi with positive shut off when in the closed position. Valve body and ends shall be constructed of forged Type 316 stainless steel and valve ends shall be NPT threaded connections. The ball shall have a full bore port design machined from a solid metal piece with highly polished surfaces. The ball and stem shall be manufactured from Type 316 stainless steel. Manually operated ball valves shall be furnished with lever operators manufactured of forged Type 316 stainless steel with a molded vinyl sleeve. Stainless steel ball valves shall be Type 1000 Neles-Jamesbury screwed end ball valves, or an equal approved by the Engineer.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install piping specialties of the sizes and types in accordance with the manufacturer's instructions, and in the locations shown on the Drawings or specifies herein.

END OF SECTION

SECTION 15122

AIR RELEASE AND VACUUM RELEASE VALVES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: This section includes materials and installation of various types of air and vacuum valves and air release valves for water service.
- B. General Design:
 - 1. Valves shall have a working pressure rating of 150 psi, minimum.
 - 2. Combination air/vacuum valves shall vent large quantities of air when the pipeline is filling, release small quantities of air when the pipeline is pressurized and allow reentry of air into the pipeline when pumps stop to prevent vacuum. Air release valves shall vent small quantities of air while the pipeline is pressurized.

1.02 QUALITY ASSURANCE

- A. Qualifications: All air and vacuum release valves, for the same service, shall be manufactured by one manufacturer and shall be in accordance with Section 15100.
- B. Warranty: See Section 15100
 - 1. Equipment Manufacturers (see also PART 2 of this section): APCO Valve & Primer Corporation, Val-Matic, or approved equal.

1.03 SUBMITTALS

- A. General: Submittals must be in accordance with Section 15100

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. General: Product delivery, storage, and handling shall be in accordance with Section 15100.

1.05 SPECIAL TOOLS AND SPARE PARTS

- A. General: Provide special tools in accordance with Section 15100.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Potable Water Service (Water Main):
 - 1. Combination Air Valves (SCAV):
 - a. Design: Single body, double orifice to allow large volumes of air to escape or enter pipe.
 - b. Materials:
 - 1) Body and Cover: ASTM 126 GRB Cast Iron
 - 2) Float and Stem: ASTM A-240 Stainless Steel
 - 3) Needle and Seat: Buna-N Nitrile Rubber

- 4) Plug: ASTM B-124 Bronze
- 5) Leverage frame: Delrin or Cast Iron ASTM D-1233
- c. Isolation Valve: Cast iron plug valve or resilient seated gate valve
- d. Accessories: Blow-off valve and backflushing capabilities
- e. Manufacturer: APCO Series 440 SCAV, Val-Matic Series 800 or equal, appropriately sized for intended service or as indicated on the Drawings.

2. Air Release Valve (SARV):

- a. Design: Automatically releases air, gas, or vapor under pressure through small venting orifice during system operation.
- b. Materials:
 - 1) Body and Cover: ASTM A-48 Cast Iron
 - 2) Float and Stem: ASTM A-240 Stainless Steel
 - 3) Needle and Seat: Buna-N Nitrile Rubber
 - 4) Plug: ASTM B-124 Bronze
 - 5) Leverage Frame: ASTM D-2133/ASTM A-48 Delrin/Cast Iron
- c. Isolation Valve: Resilient seated gate valve or stainless ball valves.
- d. Accessories: Blow-off valve and backflushing capabilities
- e. Manufacturer: APCO model 400, 450, Val-Matic Series 48A, 49A, or equal appropriately sized for intended service or as indicated on the Drawings.

B. Valve End Connections:

- 1. Valves smaller than 4 inches shall have threaded ends. Valves 4 inches and larger shall have flanged ends.
- 2. Flanges for Class 150 valves shall comply with ANSI B16.1, Class 125. Flanges for Class 300 valves shall comply with ANSI B16.1, Class 250.
- 3. Threaded ends shall comply with ANSI B2.1

C. Bolts and Nuts for Flanged Valves:

- 1. Bolts and nuts for flanges valves located indoors and in vaults and structures shall be carbon steel, ASTM A-307, Grade B.
- 2. Bolts and nuts for flanged valves located outdoors above ground shall be Type 316 stainless steel conforming to ASTM A-193, Grade B8M or bolts, and ASTM A-194, Grade 8M for nuts.

D. Gaskets: Gaskets for flanged end valves shall be as described in the detail piping specifications.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install valve in accordance with the manufacturer's instructions and recommendations and as shown on the Drawings. Direct tapping may be utilized in lieu of service saddles with ductile iron for tapping sizes up to 1 inch tap size, provided the D.I.P wall thickness will affect three (3) full AWWA C800 Standard threads.
- B. Install all valves in the vertical position and allow sufficient clearance around valve for proper maintenance and removal.
- C. Clean flanges by wire brushing before installing flanged valves. Clean flange bolts and nuts by wire brushing, lubricate threads with oil and graphite, and tighten nuts uniformly and progressively. If flanges leak under pressure testing, loosen and remove the nuts and bolts, reseal or replace the gasket, reinstall or retighten the bolts and nuts, and retest the joints. Joints shall be watertight.
- D. Clean threaded joints by wire brushing or swabbing. Apply Teflon joint compound or Teflon tape to pipe threads before installing threaded valves. Joints shall be watertight.
- E. Valve Pressure Testing: Test valve at the same time the connecting pipelines are pressure tested. Protect or isolate any part of valves, operators, or control and instrumentation systems whose pressure rating is less than the test pressure.

3.02 START-UP

- A. Check out all valves and demonstrate all valves for proper operation in accordance with Division 1.

END OF SECTION