SPECIFICATIONS

FOR

Grinder Pump Lateral Kit Upgrades Project

OWNER:

Key Largo Wastewater Treatment District

103355 Overseas Highway,
Key Largo, Florida 33037

by

THE WEILER ENGINEERING CORPORATION

6805 OVERSEAS HIGHWAY
MARATHON, FLORIDA

February 2024

THIS IS TO CERTIFY THAT THE ENCLOSED ENGINEERING SPECIFICATIONS WERE PREPARED BY ME OR UNDER MY RESPONSIBLE CHARGE.

Edward R. Castle, P.E.
State of Florida, License No. 58574 This item has been
digitally signed and sealed by Edward R. Castle, P.E. on the date indicated here.
02/19/2024
Printed copies of this document are not considered signed and sealed and the digital signature must be verified on any electronic copies.

Edward R. Castle

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Date: 2024.02.19 15:50:44 -05'00'

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02/19/2024
Date

TECHNICAL SPECIFICATIONS
FOR
GRINDER PUMP LATERAL KIT UPGRADES PROJECT

TABLE OF CONTENTS

DIVISION 1: GENERAL REQUIREMENTS

SECTION 01010

SUMMARY OF WORK

PART 1 GENERAL

1.1 RELATED DOCUMENTS

Drawings and Contract Documents, including General Conditions, Supplementary Conditions, and other Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Contract description.

B. Work by others.

C. Contractor use of Site.

D. Work sequence.

E. Owner occupancy.

1.3 CONTRACT DESCRIPTION

Contract Type: Stipulated Price as described in the Agreement.

1.4 WORK BY OTHERS

A. Work under these Contracts includes: Any portion of work described in the plans as work to be performed by others. Unless specifically stated, it is implied that all work shown is the responsibility of the contractor.

1.5 CONTRACTS

The strategy for the completion of the project consists of the contracts as follows:

A. Scope of work

The Key Largo Wastewater Treatment District intends to replace the existing lateral kits for the grinder pump system. The scope of work involves removal and replacement of the existing lateral kits with new stainless steel lateral kits. The work will include putting in fittings and piping needed to raise the valve assembly up to about 12" below grade, then install the new stainless steel valve assembly in a meter box as detailed in the project plans and specifications. The KLWTD invites interested contractors to bid on the construction project detailed herein. All products and construction shall meet the requirements of the KLWTD Construction Standards and those of the current version of the Florida Building Code. The Respondent shall be aware of the construction standards

1.7 WORK SEQUENCE

Construct Work in phases to accommodate Owner's occupancy requirements and Work by Others during the construction period, coordinate construction schedule and operations with Owner.

1.8 OWNER OCCUPANCY

B. Owner intends to occupy the existing portion of the facility to maintain operations.

C. Owner will occupy the Site during the entire period of construction for the conducting of normal operations.

D. Cooperate with Owner to minimize conflict, and to facilitate Owner's operations.

E. Schedule the Work to accommodate Owner occupancy.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

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SECTION 01200

PROJECT MEETINGS

PART 1 GENERAL

1.1 SCOPE

A. This section specifies administrative and procedural requirements for project meetings including but not limited to:
   1. Pre-Construction Conference.
   2. Progress Meetings.

B. Construction schedules are specified in another Division 1 section.

1.2 RELATED DOCUMENTS

Drawings, general conditions of the Contract, including General Provisions and other Division 1 specification sections, apply to this section.

1.3 PRE-CONSTRUCTION CONFERENCE

A. Attend and participate in a pre-construction conference and organizational meeting at the project site or other convenient location no later than 15 days after execution of the Agreement and prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments.

B. Attendees - The Owner, Engineer and their consultants, the contractor and its superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the work.

C. Agenda - Discuss items of significance that could affect progress including such topics as:
   1. Tentative construction schedule.
   2. Critical work sequencing.
   3. Designation of responsible personnel.
   4. Procedures for processing field decisions and Change Orders.
   5. Procedures for processing Applications for Payment.
   6. Distribution of Contract Documents.
   7. Submittal of shop drawings, product data and samples.
   8. Preparation of record documents.
   9. Use of the premises.
   10. Office, work and storage areas.
   11. Equipment deliveries and priorities.
   12. Safety procedures.
   13. First aid.
   14. Security.

15. Housekeeping.
16. Working hours.

1.4 PROGRESS MEETINGS

A. Conduct progress meetings at the project site at regularly scheduled intervals but not less than monthly. Notify the Owner and Engineer of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request.

B. Attendees - In addition to representatives of the Owner and Engineer, each subcontractor, supplier or other entity concerned with current progress or involved in planning, coordination or performance of future activities shall be represented at these meetings by persons familiar with the Project and authorized to conclude matters relating to progress.

C. Agenda - Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the project.
   1. Contractor's Construction Schedule
      a. Review progress since the last meeting.
      b. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule.
      c. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so.
      d. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the contract time.
   2. Contractor's Submittal Schedule.
      a. Review progress since the last meeting.
      b. Determine where each activity is in relation to the Contractor's Submittal Schedule, whether on time or ahead or behind schedule.
      c. Determine how submittals behind schedule will be expedited; secure commitments from parties involved to do so.
      d. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the contract time.
   3. Review the present and future needs of each entity present, including such items as:
      a. Interface requirements.
      b. Time.
      c. Sequences.
      d. Deliveries.
      e. Off-site fabrication problems.
      f. Access.
      g. Site utilization.
      h. Temporary facilities and services.
      i. Hours of work.
      j. Hazards and risks.
      k. Housekeeping.
      l. Quality and work standards.
      m. Change Orders.
      n. Documentation of information for payment requests.

D. Reporting - No later than 3 days after each progress meeting date, distribute copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

E. Schedule Updating - Revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

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SECTION 01270

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 DESCRIPTION

A. Payment for all Work done in compliance with the Contract Documents, inclusive of furnishing all manpower, equipment, materials, and performance of all operations relative to construction of this project, will be made under Pay Items listed herein. Work for which there is not a Pay Item will be considered incidental to the Contract and no additional compensation will be allowed.

B. The CONTRACTOR shall take no advantage of any apparent error or omission in the Drawings or Specifications, and the OWNER'S REPRESENTATIVE shall be permitted to make corrections and interpretations as may be deemed necessary, for fulfillment of the intent of the Contract Documents.

C. The OWNER'S REPRESENTATIVE will make measurements and determinations, as necessary, to classify the work within pay items and determine the quantities for pay purposes.

D. Where pay item numbers are shown on the bid form, they generally follow FDOT pay item number formatting; however, they are only provided to use them for pay application purposes. FDOT pay item descriptions do not apply; utilize the descriptions on the bid form and within this section to determine the work associated with each pay item.

PART 2 PAY ITEMS

2.01 MOBILIZATION/DEMOBILIZATION

A. Mobilization/Demobilization includes preparatory work and operations in mobilizing for beginning work on the project, including, but not limited to those operations necessary for the movement of personnel, equipment, preconstruction video, supplies, and incidentals to the project site and to remove all personnel, equipment, excess supplies, and incidentals for the project site at the completion of the Work. Mobilization/Demobilization shall not exceed 5% of the total Bid.

B. Unit of measure is Lump Sum

2.02 BONDS & INSURANCE

A. Bonds and Insurance as required by the General Conditions.

B. Unit of measure is Lump Sum

2.03 LATERAL KITS FOR GRINDER PUMP STATIONS PURCHASE & PROCUREMENT

A. Work includes the purchase and procurement of the odor control system and control panels for Vacuum Station A without sales tax or Contractor markup. This item may be purchased under the Key Largo District's Owner Direct Purchase (ODP) option as shown on the Contract Plans and Contract Documents.

B. Unit of measure is Each.

2.04 LATERAL KITS FOR GRINDER PUMP STATIONS REMOVAL & REPLACEMENT

A. Work includes excavation and removal of the existing lateral kits for the grinder pump stations and installation of new stainless steel lateral kits. Additionally, this line item includes coordination with KLWTD staff to get access on the private properties where the work will be taking place.

B. Unit of measure is Each.

2.05 CONCRETE RESTORATION

A. Work includes the restoration of any concrete that was damaged during the installation of the lateral kits on public or private properties in Key Largo, Florida.

B. Unit of measure is Each.

2.06 ASPHALT RESTORATION

C. Work includes the restoration of any asphalt that was damaged during the installation of the lateral kits on public or private properties in Key Largo, Florida.

D. Unit of measure is Each.

2.07 SOD AND GRAVEL RESTORATION

E. Work includes the restoration of any sod and gravel that was damaged during the installation of the lateral kits on public or private properties in Key Largo, Florida.

F. Unit of measure is Each.

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.1 EQUIPMENT DELIVERY AND CONSTRUCTION SCHEDULE

Not later than 10 consecutive calendar days after the issuance of the "Notice to Proceed," the Contractor shall submit to the Engineer for review a detailed schedule of major equipment delivery and installation and general construction operations, indicating the sequence of the work, the estimated dates of starting each task, and the estimated time of completion of each task. The schedule shall be broken down with respect to individual structures and facilities, indicating when existing structures or equipment would be taken out of service (if applicable). The form and content of the schedule shall be satisfactory to the Engineer.

1.2 SHOP DRAWINGS AND PRODUCT DATA

A. The Contractor shall submit to the Engineer for review and approval complete drawings and engineering data for all equipment, materials, and products to be incorporated into the work. Shop drawings and engineering data shall be provided, and the Engineer's review will be conducted in accordance with the requirements of this section. Shop drawings and/or engineering data, as appropriate, shall be submitted for the following items, including, but not limited to all items shown on the Drawings or specified in these Specifications.

B. Engineering data submitted for items of mechanical and electrical equipment shall include the following, as applicable:

1. Complete material specifications and bill of materials
2. Performance specifications and curves and operating characteristics
3. Shipping, handling, storage, and protection instructions
4. Anchorage and embedment details
5. Assembly, erection, and installation diagrams and instructions
6. Assembled weight
7. Welding qualifications and qualification procedures
8. Factory test data and results
9. Specifications on surface preparation and shop finishes
10. Manufacturers' product bulletins or catalog sheets.

C. Shop drawings and engineering data for equipment supplied as a pre-engineered or pre-assembled system shall include complete shop drawings and engineering data on each component of that system. In all cases, the information provided shall be sufficient to determine if the material or product conforms to the requirements of the Specifications.

D. Shop drawings and engineering data shall be prepared by the original equipment vendors or fabricators, as applicable. Purchase specifications by the Contractor or his Supplier shall not be acceptable as a substitute for actual vendor drawings and data.

E. Shop drawings for motor control circuits shall include complete schematic control diagrams, wiring diagrams, and terminal connection diagrams. Each control step in the schematic control diagrams shall include a step identification number and a brief functional description. Each control step shall be cross-referenced with other control steps with which it connects using the appropriate step identification numbers.

F. Shop drawings for instrument and control systems shall include, where applicable, complete process and instrumentation diagrams in ISA format, detailed loop diagrams, program descriptions, logic diagrams, wiring diagrams, and terminal connection diagrams.

G. All controls shall be completely described as to function: normally-open, normally-closed, fail open, fail closed, direct acting, reverse acting, air-to-open, air-to-close, etc. Settings of all pressure and temperature switches, relief valves, rupture discs, pressure regulators, etc., shall be noted.

H. All shop drawings shall include a legend or other suitable means to identify all symbols and abbreviations used on the drawing. Where an accepted, industry-wide drafting standard or symbol has been established for a particular item, information depicted on the shop drawings shall conform to that standard.

I. Shop drawings shall be dimensioned using the U.S. standard unit of measurement (feet and/or inches). Size of drawing shall not exceed 24 by 36 inches. All scaled drawings and details shall have the scale clearly noted on the drawing or detail. All information shall be clear and legible.

J. Each shop drawing and each item of engineering data shall contain a cover sheet that bears the Contractor's approved stamp indicating that the Contractor has reviewed the drawing or data for conformance with the Contract Documents. The cover sheet shall also allow room for the Engineer's review stamp, which is approximately $3^1/_2$ inches wide by $4^1/_2$ inches high.

K. All design calculations and drawings for foundations and footings, sheeting and shoring, and concrete formwork shall bear the signed and dated stamp of a licensed professional engineer.

1.3 MISCELLANEOUS SUBMITTALS

A. The Contractor shall submit to the Engineer miscellaneous information, procedures, test data, samples, etc., in the manner and at the time specified in these Specifications and Contract Documents. Miscellaneous submittals shall include, but not be limited to, the following:
   1. Procedures for handling and disposing of sewage flows during construction.
   2. Factory test data and results where specified for specific items of equipment.
   3. Schedule of values.
   4. Preliminary Operation and Maintenance Manuals.
   5. Final Operation and Maintenance Manuals.
   6. Samples of wire and cable, casework, window glazing details, concrete masonry units, quarry tile, roofing and flashing, push-on PVC joint details, and other items as specified in the Specifications.
   7. Preliminary concrete mix design reports.

8. Satisfactory written evidence in the form of laboratory or mill test reports indicating that all cement, aggregate, masonry, structural steel, fencing, castings, steel reinforcement, conduit, pipe, grout, grass seed and other items incorporated into the work are in compliance with the requirements of these Specifications.
9. Project record documents.
10. Copies of original invoices of all equipment delivered to the site.
11. When requested, analysis and design data on concrete formwork and sheeting and shoring.
12. Drawings and details of erosion and sediment control structures.
13. Written evidence of equipment warranties.

1.4 SAMPLES

At the Engineer's request, the Contractor shall furnish certified samples of materials utilized in the fabrication or production of equipment, materials, and products supplied under these Contract Documents. Cost of all such samples shall be borne by the Contractor. The samples will be tested by a qualified independent testing laboratory selected by the Owner to determine if the mechanical and chemical properties of the materials supplied are in accordance with the requirements of these Specifications and Contract Documents. The Owner shall pay for the laboratory testing of material samples provided by the Contractor. The Contractor shall pay for all retests made necessary by the failure of materials to conform to the requirements of these Specifications and Contract Documents.

1.5 PROGRESS RECORD PICTURES

A. The Contractor shall furnish three copies of 5- by 7-inch pictures as a record of progress made each month. These pictures will be a minimum of six each month taken from locations designated by the Resident Project Representative to best show progress of Project and will include the following:
   1. Project name
   2. Owner's name and contract number
   3. Contractor's name and job number
   4. View and general description of what photograph shows
   5. Date photograph was taken.

   Prints shall be submitted to the Engineer in a regular photograph mailer marked "Photographs-Do Not Bend." Cost of photographs shall be included in the lump sum price bid and no separate payment will be made therefore.

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SECTION 01310

CONSTRUCTION SCHEDULING

PART 1 GENERAL

1.1 DESCRIPTION

The Contractor shall submit to the Engineer for approval construction planning, scheduling, and cost value documentation pertaining to the Project as detailed herein and shall update same throughout Project as required.

1.2 SUBMITTAL PROCEDURES

A. Within ten (10) working days of Notice to Proceed, the Contractor shall submit to the Engineer for approval the products required by this section of the Specifications.

B. Within five (5) working days following receipt of same the Engineer shall arrange for a meeting with the Contractor so as to familiarize the Engineer with the Contractor's proposed construction plans and schedules.

C. Within five (5) working days following the Engineer's review the Contractor shall resubmit a corrected copy of those documents requiring revision.

D. Within five (5) working days following his receipt of the adequately revised documents the Engineer will approve same for use on the Project.

E. Once approved, the Contractor shall submit four (4) copies of the construction scheduling documents to the Engineer for use on the Project.

F. The Contractor shall update the work schedules at least monthly and indicate those activities whose completion dates are in jeopardy because of activities behind schedule.

G. The Owner may require the Contractor to modify any portions of the work schedule that become infeasible because of "activities behind schedule" or for any other valid reason. Any such modification will be at the Contractor's expense unless the modification is required to accommodate schedule revisions required by the Owner.

H. An activity that cannot be completed by its original latest completion date shall be deemed to be behind schedule.

1.3 CHANGE ORDERS

Upon approval of a Change Order by the Owner the approved change shall be reflected in the next submittal by the Contractor.

PART 2 PRODUCTS

2.1 CONSTRUCTION PROGRESS SCHEDULE

A. The Construction Progress Schedule shall be submitted in form satisfactory to the Owner showing the following items of each of the various subdivisions of work required under the Contract Document, Specifications, and Drawings.
   1. Activity Number
   2. Activity Description
   3. Estimated Activity Duration (Work Days)
   4. Activity Start Date (Calendar Dated)
   5. Activity Finish Date (Calendar Dated)
   6. Activity Cost

B. The anticipated amount of each monthly payment that will become due the Contractor in accordance with the progress schedule shall be included thereon. This anticipated monthly payment schedule shall distribute the costs of the project more or less evenly over the scheduled project life in a manner acceptable to the Owner and compatible with the Owner's funding arrangements for the project. Resubmittal will be required until anticipated monthly payment schedule is acceptable to Owner. For this Project, substantial variation from this schedule of payments will not be permitted.

C. Schedule Format
   1. The project schedule shall be in the form of a Gantt chart depicting the anticipated critical path for construction activities or equipment delivery. A critical path bubble type schedule shall also be acceptable.
   2. The schedule shall be updated monthly or at appropriate intervals that are consistent with the actual project schedule. Shall at any time the actual project work be found to deviate more than 45 days from the schedule, the schedule shall be modified to reflect the actual and newly project work completion date.

D. The Contractor shall prepare a separate schedule of anticipate partial payments (commonly referred to as an “S” curve) in lieu of a combined payment and work activity schedule.

2.2 TEMPORARY FACILITIES AND CONSTRUCTION TRAFFIC MANAGEMENT

A. The contractor shall provide a schematic plan for routing of construction traffic. The plan must minimize the impact to regular landfill and road department traffic. Where an unavoidable conflict exists, a plan for management of that conflict must be provided.

B. Along with the Construction Progress Schedule, a list of required temporary facilities, including but not limited to temporary haul roads and temporary soil erosion sedimentation control shall be provided.

2.3 ESTIMATES

A. The Detailed Estimates shall give a complete and satisfactory breakdown of the Contract amount.

B. Periodic Itemized Estimates shall detail work done for the purpose of tabulating partial payments thereon.

2.4 PROJECT INFORMATION

A. Each tabulation shall be prefaced with the following summary data:
   1. Project Name
   2. Contractor
   3. Type of Tabulation (Initial or Updated with revision number)
   4. Project Duration
   5. Project Scheduled Completion Date
   6. Effective or Starting Date of the Schedule
   7. If an updated (revised) schedule, the new project completion date and project status

2.5 SCHEDULE MONITORING

A. When specifically requested by the Engineer, the Contractor shall submit to the Engineer a revised schedule for those activities that remain to occur.

B. The revised schedule shall be submitted in the form, sequence, and of the number of copies requested for the initial schedule.

2.6 COST VALUE FOR ACTIVITIES

A. The Contractor shall establish and submit a cost value for each activity in his progress schedule and estimates so that monthly partial payments to the Contractor can be calculated on the basis of work in place.

B. Subject to the provisions for "Partial Payments" in the General Conditions of the Contract all cost value reports for network activities shall be based upon the close of books as of the 20th day of each month, and the submittal of such costs value for activities shall be submitted to the Engineer for review and approval not later than the 25th day of each month.

C. Wherever in the Contract Documents it is provided that payments will be allowed for materials delivered to the site but not yet incorporated in the work, subject to the terms and conditions specified in the General Conditions, separate pay items shall be established for furnishing and installation of such items.

D. Costs of materials delivered to the site but not yet incorporated into the work shall be included as a separate pay item and shall not be included in the cost value of the installation activity for such materials.

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SECTION 01315

PRECONSTRUCTION VIDEO

PART 1 GENERAL

1.1 DESCRIPTION

Provide continuous color audio-video recording along the entire length of all proposed work prior to construction to serve as a record of pre-construction conditions. Supplement audio-video recordings with color photographs (digital) for areas which require details not ascertainable on the recording.

1.2 QUALIFICATIONS

The preconstruction audio-video recording shall be of professional quality that will clearly log an accurate visual description of existing conditions. Any portion of the recording not acceptable for the determination of the existing conditions shall be re-recorded at no additional cost to the Owner.

PART 2 PRODUCTS

2.1 GENERAL

The total audio-video recording system and the procedures employed in its use shall be such as to produce a finished product that will fulfill the technical requirements of the project. The video portion of the recording shall produce bright, sharp, clear pictures with accurate colors and shall be free from distortion, tearing, rolls or any other form of picture imperfection. The audio portion of the recording shall produce the commentary of the camera operator with proper volume, clarity, and be free from distortion.

2.2 CAMERA

1. Resolution: Minimum 1080p HD resolution, with preference for 4K support.

2. Color Profile: Must support at least sRGB color profile. Adobe RGB and RAW format support is desirable.

3. Zoom Capabilities: Must have an optical zoom function with a minimum of 10x zoom.

4. Image Stabilization: Must have built-in image stabilization.

5. Auto-Focus: Must include an auto-focus system with face detection and tracking capabilities.

6. Low Light Performance: Must perform well in low light conditions and possess high dynamic range capabilities.

7. Frame Rate: Minimum required frame rate is 30fps, with preference for 60fps.

8. Durability: Must be built with durability in mind, with bonus for dust and water resistance.

9. Battery Life: Must have a battery life adequate for extended shooting sessions. The capability to swap batteries is required.

10. Storage: Must support external storage, with a minimum support for 128GB SD

2.3 RECORDER

1. Recording Format: Must support MP4 format, due to its wide compatibility and good balance between file size and quality. Support for MOV format can also be useful for Mac users.

2. Codec: Must support modern efficient codecs such as H.264 or H.265 (HEVC) for video, and AAC or MP3 for audio.

3. Bit Rate: The minimum video bit rate should be 50 Mbps when recording in 1080p and a minimum of 100 Mbps when recording in 4K.

4. Audio: Must have a built-in microphone for audio capture, with an option to attach an external microphone for better audio quality. Should support stereo audio recording.

5. Frame Rate: Must support multiple frame rates including 24fps, 30fps, and 60fps to cater to different shooting requirements.

6. Recording Modes: Must support continuous recording, with automatic file splitting when the file size reaches 4GB.

2.4 VIDEO PLAYBACK COMPATIBILITY

1. Supported Formats: The playback device or software must support MP4 and MOV formats.

2. Supported Codecs: Must be compatible with H.264 or H.265 (HEVC) for video, and AAC or MP3 for audio.

3. Resolution: Must support playback in at least 1080p resolution, with preference for devices or software that support 4K playback.

4. Frame Rate: Should be capable of playing videos at various frame rates, such as 24fps, 30fps, and 60fps.

5. Bit Rate: The playback system should be capable of handling high bit rate videos. Ideally, it should support videos with bit rates of 50 Mbps for 1080p and 100 Mbps for 4K.

6. Sound: Must support stereo audio playback.

PART 3 EXECUTION

3.1 GENERAL

A. The recordings shall contain coverage of all surface features located within the construction's zone of influence. The construction's zone of influence shall be defined (1) as the area within the permanent and temporary easements or right- of-way, and areas adjacent to these areas which may be affected by routine construction operations, and (2) by the direction of the

Owner. The surface features within the construction's zone of influence shall include, but not be limited to, all roadways, pavements, curbs, driveways, ponds, sidewalks, culverts, headwalls, retaining walls, buildings, landscaping, trees, shrubbery, and fences. Of particular concern shall be the existence of any faults, fractures, or defects. Recorded coverage shall be limited to one side of the street at any one time and shall include all surface conditions located within the zone of influence of construction supported by appropriate audio description.

B. The recording of each video segment shall be a simultaneously recorded with the audio recording. This audio recording, exclusively containing the commentary of the camera operator, shall assist in viewer orientation and in any needed identification, differentiation, clarification, or objective description of the feature being shown in the video portion of the recording. The audio recording also shall be free from any conversations between the camera operator and any other production technicians.

C. All videos shall be permanently labeled and shall be properly identified by project title, number, and date of recording.

D. Each video shall have a log of that media's contents. The log shall describe the various segments of coverage contained on that video tape in terms of the names of streets or easements, coverage beginning and end, directions of coverage, and video unit counter/segment numbers.

3.2 RECORDING SCHEDULE

A. The recording shall be performed prior to the placement of any construction materials or equipment on the proposed construction site.

B. The Contractor shall coordinate the recording with the construction schedule so that those portions of the construction that will be completed first will be recorded first. The recording company shall deliver the videos to the Owner upon their completion. Upon delivery of the videos, transfer of ownership of those videos shall be made to the Owner.

3.3 VISIBILITY

All recordings shall be performed during times of good visibility. No recording shall be done during periods of significant precipitation, mist, or fog. The recording shall only be done when sufficient sunlight is present to properly illuminate the subject, and to produce bright, sharp video recordings of those subjects. No taping shall be performed when more than 10% of the area to be taped contains debris or obstructions unless otherwise authorized by the Engineer.

3.4 CONTINUITY OF COVERAGE

A. In order to increase the continuity of the coverage, the coverage shall consist of a single, continuous, unedited recording which begins at one end of a particular construction area. However, where coverage is required in areas not accessible by conventional wheeled vehicles and smooth transport of the recording system is not possible, such coverage shall consist of an organized, interrelated sequence of recordings at various positions along that proposed construction area (e.g., wooded easement area).

B. The average rate of travel during a particular segment of coverage (e.g., coverage of one side of the street) shall be directly proportional to the number, size, and value of the surface features within that construction area's zone of influence.

3.5 CAMERA HEIGHT AND STABILITY

When conventional wheeled vehicles are used as conveyances for the recording system, the distance between the camera lens and the ground shall not be less than 10 feet. The camera shall be firmly mounted, such that transport of the camera during the recording process will not cause any unsteady picture.

3.6 CAMERA CONTROL

Camera pan, tilt, zoom-in, and zoom-out rates shall be sufficiently controlled such that recorded objects will be clearly viewed during video tape playback. In addition, all other camera and recording system controls, such as lens, focus, and aperture, video level, pedestal, chroma, white balance, and electrical focus, shall be properly controlled or adjusted to maximize recorded picture quality.

3.6 VIEWER ORIENTATION TECHNIQUES

The audio and video portions of the recording shall maintain viewer orientation. To this end, overall establishing views and visual displays of all visible house and building addresses shall be utilized. In easements where the proposed construction location will not be readily apparent in the video tape viewer, highly visible yellow flags shall be placed in such a fashion as to clearly indicate the proposed centerline of construction.

3.7 AREAS TO BE RECORDED

A. The Contractor shall be able to televise and record areas with paved roads, along easements, through parks, lawns, open fields, and inside buildings. When recording on private property, the Contractor shall give the Owner sufficient prior notice of such entry so that property owners may be advised of, and their permission obtained for, the work.

B. At no time shall the Contractor be allowed to use any electrical circuits within private property building structure. All recording shall be done during regular business hours, unless otherwise specified by the private property owner or the Engineer. The Contractor shall enter and leave private property in a professional and orderly, workmanlike manner.

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SECTION 01340

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 GENERAL

1.1 DESCRIPTION AND REQUIREMENTS

A. Type of Submittals: This Section of the specifications describes the procedures for submittals such as shop drawings, product data, samples and miscellaneous work-related submittals. It does not include the submittals required for administrative work.

B. Submittal Contents: The submittal contents required are specified in each section.

C. Definitions: Submittals are categorized as follows:
   1. Shop Drawings
      a. Shop drawings shall include technical data, drawings, diagrams, performance curves, schedules, templates, patterns, reports, calculation, instructions, measurements and similar information as applicable to specific item for which the shop drawing is prepared.
      b. Provide newly prepared information, on reproducible sheets, with graphic information at accurate scale (except as otherwise indicated) or appropriate number of prints hereof, with name or preparer (firm name) indicated. The Contract Drawings shall not be traced or reproduced by any method for use as or in lieu of detail shop drawings. Show dimensions and note those based on field measurement. Identify materials and products in the work shown. Indicate compliance with standards and special coordination requirements. Do not allow shop drawing copies without appropriate final “Action” markings by the Engineer to be used in connection with the Work.
   2. Product Data
      a. Product data includes standard printed information on materials, products and systems, not specially prepared for this project, other than the designation of selections from among available choices printed therein.
      b. Collect required data into one submittal for each unit of work or system, and mark each copy to show which choices and options are applicable to project. Include manufacturer's standard printed recommendations for application and use, compliance with standards, application of labels and seals, notation of field measurements that have been checked, and special coordination requirements.
   3. Samples
      a. Samples include both fabricated and unfabricated physical examples of materials, products and units of work, both as complete units and as smaller portions of units of work, either for limited visual inspection or (where indicated) for more detailed testing and analysis.
      b. Provide units identical with final condition of proposed materials or products for the work. Include “range” samples (not less than three units) where unavoidable variations must be expected, and describe or identify variations between units of each set. Provide full set of optional samples where the Engineer's selection is

required. Prepare samples to match the Engineer's sample where indicated. Include information with each sample to show generic description, source or product name and manufacturer, limitations, and compliance with standards. Samples are submitted for review and confirmation of color, pattern, texture, and "kind" by the Engineer. Engineer will not "test" samples (except as otherwise indicated) for other requirements, which are the exclusive responsibility of the Contractor.

4. Miscellaneous submittals related directly to the work (non-administrative) include warranties, maintenance agreements, workmanship bonds, project photographs, survey data and reports, physical work records, statements of applicability, quality testing and certifying reports, copies of industry standards, record drawings, field measurement data, operating and maintenance materials, overrun stock, security/protection/safety keys and similar information, devices and materials applicable to the Work but not processed as shop drawings, product data or samples.

1.2 GENERAL SUBMITTAL REQUIREMENTS

A. Scheduling: Where appropriate in various required administrative submittals (listings of products, manufacturers, supplier and subcontractors, and in job progress schedule), show principal work-related submittal requirements and time schedules for coordination and integration of submittal activity with related work in each instance.

B. Coordination of Submittal Times: Prepare and transmit each submittal to the Engineer sufficiently in advance of performing related work or other applicable activities, so the installation will not be delayed or improperly sequenced by processing times, including non-approval and resubmittal (if required). Coordinate with other submittals, testing, purchasing, delivery and similar sequenced activities. No extension of time will be authorized because of Contractor's failure to transmit submittals to the Engineer sufficiently in advance of the work.

C. Sequencing Requirements: As applicable in each instance, do not proceed with a unit of work until submittal procedures have been sequenced with related units of work, in a manner which will ensure that the action will not need to be later modified or rescinded by reason of a subsequent submittal which should have been processed earlier or concurrently for coordination.

D. Preparation of Submittals: Provide permanent marking on each submittal to identify project, date, Contractor, subcontractor, submittal name and similar information to distinguish it from other submittals. Show Contractor's executed review and approval marking and provide space for the Engineer's "Action" marking. Package each submittal appropriately for transmittal and handling. Submittals which are received from sources other than through the Contractor's office will be returned "without action."

E. Transmittal Identification

1. Number transmittals in sequence for each Division of the Specifications. The number after the dash indicates the Section of the Specifications, and the number before the dash is the sequence number of the transmittal (1-15140 would be the first transmittal applicable to Section 15140 of the Specifications, 2-15140 would be the second transmittal for Section 15140, etc.)

2. Identify resubmittals with a letter of the alphabet following the original number, using A for the first resubmittal, B for the second resubmittal, etc. A resubmittal affecting transmittal 1-15140 would then be numbered 1A-15140. The number 1-15140 would then be entered in the space "Previous Transmittal Number," which is left blank except on resubmittals.

1.3 SPECIFIC CATEGORY REQUIREMENTS

A. Except as otherwise indicated in the individual work sections, comply with general requirements specified herein for each indicated category of submittal.
   1. Submittals shall contain:
   2. The date of submittal and the dates of any previous submittals.
   3. The project title:
   4. Contract No. ____.
   5. Contractor:
   6. Supplier:
   7. Manufacturer:
   8. Identification of the product, with the Specification Section number and equipment tag numbers.
   9. Field dimensions, clearly identified as such.
   10. Relation to adjacent or critical features of the work or materials.
   11. Applicable standards, such as ASTM or Federal Specification numbers.
   12. Notification to the Engineer in writing, at time of submittal, of any deviations on the submittals from requirements of the Contract Documents.
   13. Identification of revisions on resubmittals.
   14. An 8-inch x 3-inch blank space for Contractor and Engineer stamps.
   15. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the Work and of Contract Documents.
   16. Submittal sheets or drawings showing more than the particular item under consideration shall have all but the pertinent description of item for which review is requested crossed out.

1.4 ROUTING OF SUBMITTALS

Submittals and routine correspondence shall be routed as follows:
1. Supplier to Contractor (through representative if applicable) for preliminary check.
2. Contractor to Consulting Engineer for general review or comment.
3. Consulting Engineer to Contractor.
4. Contractor to Supplier.

1.5 SUBMITTAL COPIES REQUIRED

A. Shop Drawings, Product Data, and Miscellaneous Submittals
   All submittals marked “A” or “B” will be distributed as follows:

1. For Engineer	1 copy
2. For Contractor	3 copies
3. For Field Inspection Office	1 copy
4. For Owner	1 copy
Total	*6 copies*

B. To the above number, additional copies may be added as required by the Contractor.

C. The Engineer will mark all copies of each shop drawing. One will be retained in the Engineer's office, one sent to the Field Inspection office, one will be retained for the Owner and the remaining copies sent to the Contractor for his records and distribution.

D. For non-approval items, such as parts lists and operation or maintenance manuals, 5 copies are required, unless specified otherwise:

1. For Owner	3 copies
2. For Engineer	2 copies
3. For Contractor	4 copies
Total	*9 copies*

E. Samples: In accordance with the QA/QC Plan, the contractor shall furnish certified samples of materials utilized in the fabrication or production of equipment, materials, and products supplied under these Contract Documents. Cost of all such samples shall be borne by the Contractor. The samples will be tested by a qualified independent testing laboratory selected by the Owner to determine if the mechanical and chemical properties of the materials supplied are in accordance with the requirements of these Specifications and Contract Documents. The owner shall pay for the laboratory testing of material samples provided by the Contractor. The Contractor shall pay for (at no additional cost to the Owner) all retests made necessary by the failure of materials to conform to the requirements of these Specifications and Contract Documents.

1.6 REVIEW OF SUBMITTALS

A. Review Time: Allow a minimum of two weeks for the Engineer’s initial processing of each submittal requiring review and response, except allow longer periods where processing must be delayed for coordination with subsequent submittals. The Engineer will advise the Contractor promptly when it is determined that a submittal being processed must be delayed for coordination. Allow two weeks for reprocessing each submittal. Advise the Engineer on each submittal as to whether processing time is critical to progress of the work, and therefore the work would be expedited if processing time could be foreshortened.

B. Engineer’s Action
   1. Final Unrestricted Release
   2. Work may proceed, provided it complies with contract documents, when submittal is returned with the following:
   3. Marking: “A” – No Exceptions Taken.
   4. Final-But-Restricted Release
   5. Work may proceed, provided it complies with notations and corrections on submittal and with contract documents, when submittal is returned with the following:
   6. Marking: “B” – Exceptions Taken as Noted.
   7. Returned for Resubmittal

8. Do not proceed with Work. Revise submittal in accordance with notations thereon, and resubmit without delay to obtain a different action marking. Do not allow submittals with the following marking (or unmarked submittals where a marking is required) to be used in connection with performance of the work.
    - Marking: “C” – Revise and resubmit.
    - Marking: “D” – Rejected; Does Not Comply with Project Requirements. Only two copies of items marked “C” or “D” will be reviewed and marked. One copy will be retained and the other copy with all remaining unmarked copies will be returned to the contractor for resubmittal.

1.7 SPECIAL SUBMITTAL REQUIREMENTS FOR EQUIPMENT, COATINGS, SEALANTS, AND OTHER SYSTEMS

The Contractor is directed to Section 01300, Submittals, for special certifications or other requirements associated with Shop Drawings and submittals.

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SECTION 01380

CONSTRUCTION PHOTOGRAPHS

PART 1 GENERAL

1.1 SUMMARY

A. General: This section specifies administrative and procedural requirements for construction photographs.

B. Costs: Costs for photographs, album pages, and album shall be included in the lump sum bid price or unit prices contained for other items of work. No separate payment shall be allowed, with the exception of additional photographs, which is addressed elsewhere in this section.

1.2 RELATED DOCUMENTS

Drawings and general conditions of Contract, including other Division 1 specification sections, apply to this section.

1.3 SUMMARY

A. Prints: Submit at least 10 but no more than 20 prints of at least four views directly to the Engineer with each monthly Application for Payment. The Engineer will distribute prints as follows:
   1. One print to the Contractor shall be retained in the field office at the project site and shall be available at all times for reference.
   2. One print to the Owner as the Owner's permanent record.
   3. One print shall be retained in the Engineer's files.

B. Extra Prints: When requested by the Engineer, the photographer shall submit extra prints of photographs, with distribution directly to designated parties who will pay the costs for the extra prints directly to the photographer.

C. All photography shall be in digital format. Back-up shall be supplied on flash drive and or C.D.

D. Photograph Albums: Provide three loose-leaf, notebook type photo albums with the first Application for Payment. Albums shall be provided as required, if more than one volume of photographs is required to contain the photographs over the length of the construction contract. The front cover of each photo album shall contain the following:
   1. Project Name
   2. Owner's Name and Contract Number
   3. Engineer's Name and Project Number
   4. Volume Number
   5. Contractor's Name

E. Album Pages: Album pages shall be punched for standard 3-ring binder. Allow 1-inch-wide margin on the left edge.

1.4 QUALITY ASSURANCE

A. Engage a qualified, experienced photographer to take photographs during construction.

B. Associated Services - Cooperate with the photographer's work. Provide reasonable auxiliary services as requested, including access to and use of temporary facilities including temporary lighting.

PART 2 PRODUCTS

2.1 PHOTOGRAPHIC COPIES

A. Provide 5-by-7-inch smooth surface, glossy color prints on single-weight, commercial-grade stock (72 pound), contained in a photo album page. The photographs shall be taken with a 35-mm camera (or larger format) capable of being programmed to show the date the photo was taken on the front of the photograph.

B. The use of digital photography shall be acceptable and may be substituted for Item 2.1 requirements above. Should the Contractor choose to use digital photography, the camera shall have a resolution of 5.0 mega pixels or greater. The print photos should be a minimum of 5-by-7-inch printed on high gloss photo grade paper of at least 72 pounds or better.

C. Should digital photography be employed by the Contractor, the project photos shall be submitted in both print and digital format. The digital format shall be in the form of a standard CD, labeled as described herein and the photo files in jpeg format.

D. Identification: Provide date on front of the photo per the previous paragraph. On the back of each print, provide an applied label or rubber-stamped impression with the following information:
   1. Name of the Project.
   2. Name and address of the photographer.
   3. Name of the Engineer.
   4. Name of the Contractor.
   5. Provide notation of vantage point marked for location and direction of shot on a key plan of the site.

PART 3 EXECUTION

3.1 PHOTOGRAPHIC REQUIREMENTS

A. Take at least four but no more than six color photographs in accordance with requirements indicated, to best show the status of construction and progress since the previous photographs.
   1. Frequency: Take photographs monthly, coinciding with the cutoff date associated with each Application for Payment.
   2. Vantage Points: The photographer shall select the vantage points for each shot each month to best show the status of construction and progress since the last photographs.

B. Additional Photographs: From time to time the Engineer may issue requests for additional photographs, in addition to periodic photographs specified. Additional photographs will be paid for by the Owner or Engineer and are not included in the contract sum or an allowance.

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SECTION 01540

JOB SECURITY

PART 1 GENERAL

1.1 BARRICADES, LIGHT, AND WATCHMEN

A. The Contractor shall furnish and erect such barricades, fences, lights, and danger signals, shall provide such watchmen, and shall provide such other precautionary measures for the protection of persons or property and of the work as are necessary. Barricades shall be painted in a color that will be visible at night. From sunset to sunrise, the Contractor shall furnish and maintain at least one light at each barricade and sufficient numbers of barricades shall be erected to keep vehicles from being driven on or into any work under construction. The Contractor shall furnish watchmen in sufficient numbers to protect the work.

B. The Contractor will be held responsible for all damage to the work due to failure of barricades, signs, lights, and watchmen to protect it and whenever evidence is found of such damage, the Contractor shall immediately remove the damaged portion and replace it at his cost and expense. The Contractor's responsibility for maintenance of barricades, signs, and lights and for providing watchmen shall not cease until the project has been accepted by Owner.

END OF SECTION

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SECTION 01562

DUST CONTROL

PART 1 GENERAL

1.1 DESCRIPTION

Limit blowing dust caused by construction operations by applying water or employing other appropriate means or methods to maintain dust control. Means or methods other than potable water shall be submitted to the Engineer for approval.

1.2 PROTECTION OF ADJACENT PROPERTY

The bidders shall visit the site and note the buildings, landscaping, roads, parking areas and other facilities near the work site that may be damaged by their operations. Contractor shall make adequate provision to fully protect the surrounding area and will be held fully responsible for all damages resulting from his operations.

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SECTION 01630

PRODUCT SELECTION AND SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES: Product selection and substitution procedures.

1.2 PRODUCT SELECTION

A. Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, new at the time of installation.

B. To the fullest extent possible, provide products of the same kind from a single source.

C. Compatibility among product options is required. Where more than one choice is available as options during product selection, select an option which is compatible with other products and materials already selected.

D. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.

E. Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

F. Where Contract Documents are at variance with specific manufacturer's details and installation procedures, contact Engineer for resolution prior to start of work.

1.3 SUBSTITUTIONS

A. The intent of these Specifications is to provide the Owner with a quality facility without discouraging competitive bidding. Substitutions may be submitted and will be evaluated as specified herein.

B. The Contractor’s bid includes products named in the Specifications The Contractor may propose a substitute product under and in accordance with the Standard General Conditions (Section 00700) Subsection 6.05, as modified by the Supplementary Conditions (Section 00800.) Unless the Engineer expressly approves the substitute, the Contractor must provide a product named in the Specifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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SECTION 01640

STORAGE AND PROTECTION

PART 1 GENERAL

1.1 GENERAL

A. Equipment shall be received, inspected, unloaded, handled, stored, maintained, and protected by the Contractor in a suitable location on or off site, if necessary, until such time as installation is required.

B. Storage and protection of Contractor-furnished equipment shall be in strict conformance with the requirements of these Specifications.

1.2 STORAGE

A. The Contractor shall be responsible for providing satisfactory storage facilities which are acceptable to the Engineer. In the event that satisfactory facilities cannot be provided on-site, satisfactory warehouse facilities, acceptable to the Engineer, will be provided by the Contractor for such time until the equipment, materials, and products can be accommodated at the site.

B. Equipment, materials, and products which are stored in a satisfactory warehouse acceptable to the Engineer will be eligible for progress payments as though they had been delivered to the job site.

C. The Contractor shall be responsible for the maintenance and protection of all equipment, materials, and products placed in storage and shall bear all costs of storage, preparation for transportation, transportation, rehandling, and preparation for installation.

D. Equipment and products stored outdoors shall be supported above the ground on suitable wooden blocks or braces arranged to prevent excessive deflection or bending between supports. Items such as pipe, structural steel, and sheet construction products shall be stored with one end elevated to facilitate drainage.

E. Unless otherwise permitted in writing by the Engineer, building products and materials such as cement, grout, plaster, gypsum-board, particleboard, resilient flooring, acoustical tile, paneling, finish lumber, insulation, wiring, etc., shall be stored indoors in a dry location. Building products such as rough lumber, plywood, concrete block, and structural tile may be stored outdoors under a properly secured waterproof covering.

F. Tarps and other coverings shall be supported above the stored equipment or materials on wooden strips to provide ventilation under the cover and minimize condensation. Tarps and covers shall be arranged to prevent ponding of water.

1.3 EXTENDED STORAGE

In the event that certain items of major equipment such as air compressors, pumps, and mechanical aerators have to be stored for an extended period of time, Contractor shall provide satisfactory long-term storage facilities that are acceptable to the Engineer. The Contractor shall provide all special packaging, protective coverings, protective coatings, power, nitrogen purge, desiccants, and lubricants, exercising necessary or recommended directive by the manufacturer to properly maintain and protect the equipment during the period of extended storage.

END OF SECTION

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SECTION 01710

CLEANUP

PART 1 GENERAL

1.1 DESCRIPTION

This section covers general cleaning which the Contractor shall be required to perform both during construction and before final acceptance of the project unless otherwise shown on the Drawings or specified elsewhere in these Specifications.

1.2 HAZARD CONTROL

A. The Contractor shall store volatile wastes in covered metal containers and remove from premises daily.

B. The Contractor shall prevent accumulation of wastes which create hazardous conditions.

C. Burning or burying rubbish and waste materials on the site shall not be allowed.

D. Disposal of volatile wastes into sanitary or storm sewers shall not be allowed.

1.3 DISPOSAL OF SURPLUS MATERIALS

A. Unless otherwise shown on the Drawings, specified or directed, the Contractor shall dispose of all surplus materials and equipment from demolition, legally off the site, and shall provide his own suitable, off-site spoil area, or on a site designated by the Owner.

B. The Owner shall have the opportunity to inspect any equipment or materials removed prior to disposal by the Contractor. If said equipment and/or materials are determined to be salvageable by the Owner, the Contractor shall transport said equipment and material to a building or area designated by the Owner.

1.4 FINAL CLEANING

The Contractor shall:

A. Schedule cleaning operations so that dust and other contaminants resulting from the cleaning process will not fall on wet, newly painted surfaces.

B. Employ experienced workmen or professional cleaners for final cleaning.

C. Broom clean paved surfaces; rake clean other surfaces of grounds.

D. Upon completion of the work, Contractor shall remove from the site all plant, material, tools and equipment belonging to him, and leave the site with an appearance acceptable to the Engineer.

E. Restoration of Landscape Damage - Any landscape feature scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition at the Contractor's expense. The Engineer will decide what method of restoration shall be used.

F. Post-Construction Cleanup or Obliteration - Contractor shall obliterate all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, or any other vestiges of construction.

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SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.1 MAINTENANCE OF DOCUMENTS

A. The Contractor shall maintain accurate record documents related to the furnishing and installation of equipment, materials, and products at the site of the project during the course of the work.

B. The Contractor shall maintain at the project site one record copy of each of the following:
1. Contract Drawings
2. Specifications
3. Addenda
4. Reviewed Shop Drawings
5. Change Orders
6. Other Modifications to Contract Documents
7. Field Test Records

Project record documents shall be stored in suitable files and racks in a location satisfactory to the Engineer and shall be available at all times to the Engineer. The documents shall be maintained in a clean, dry, legible condition and shall not be used for construction purposes.

1.2 RECORDING

The Contractor shall label each document "Project Record" in one-inch high letters. Record documents shall be kept current and work shall not be permanently concealed until the required information has been recorded.

A. Contract Drawings: Contractor shall legibly mark to record the actual construction on the project record set of prints of the Contract Drawings, including reviewed shop drawings, the following:
1. Horizontal and vertical location of underground utilities and appurtenances referenced to mean sea level or permanent surface improvements.
2. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
3. Field changes of dimension and detail, including elevations of foundations.
4. Changes made by change order or field order.
5. Details not on original Drawings.

After completion of the work, the Contractor shall prepare a reproducible set of project record drawings by drafting: (1) the notations made on the record set of prints onto a set of reverse reading, translucent, matte finish, mylar reproducible Drawings furnished by the Owner; and (2) notations on the record set of shop drawings onto translucent, matte finish, mylar reproducible (ozalid process) copies of the reviewed shop drawings furnished by the Contractor.

B. Specifications and Addenda: The Contractor shall legibly mark up each section to record:
   1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed
   2. Changes made by change order or field order
   3. Other matters not originally specified.

1.3 SUBMITTAL

At the completion of the work and prior to final acceptance by the Owner, the Contractor shall deliver the Project Record Documents to the Engineer. The Project Record Documents shall be acceptable to the Engineer before final payment is made.

With the submittal of the Project Record Documents the Contractor shall submit a list of each document submitted and a certification that each document as submitted is complete and accurate.

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SECTION 01730

GUARANTEES AND WARRANTIES

PART 1 GENERAL

1.1 GENERAL WARRANTY

A. The Contractor shall warrant all equipment, materials, products, and workmanship provided by the Contractor under these Contract Documents for a period of 12 months after the date of final acceptance of the Work by the Owner.

B. If, during the warranty period

1. any equipment, materials, or products furnished and/or installed by the Contractor are found to be defective in service by reason of the Contractor's faulty process, structural and/or mechanical design or specifications, or
2. any equipment, materials, or products furnished and/or installed by the Contractor are found to be defective by reason of defects in material or workmanship, the Contractor shall, as soon as possible, after receipt of written notice from the Owner, repair or cause to be repaired such defective equipment, materials or products, or replace such defective equipment, materials or products.

C. In the event of multiple equipment failures of major consequence prior to the expiration of the one-year warranty described above, the affected equipment shall be disassembled, inspected, and modified or replaced as necessary to prevent further occurrences. All related components that may have been damaged or rendered non-serviceable as a consequence of the equipment failure shall be replaced. A new 12-month warranty against defective or deficient design, workmanship, and materials shall commence on the day that the item of equipment is reassembled and placed back into operation. As used herein, multiple equipment failures shall be interpreted to mean two or more successive failures of the same kind in the same item of equipment or failures of the same kind in two or more items of equipment. Major equipment failures may include, but are not limited to, cracked or broken housings, piping, or vessels, excessive deflections, bent or broken shafts or structural members, broken or chipped gear teeth, overheating, premature bearing failure, excessive wear, or excessive leakage around seals. Equipment failures which are directly and clearly traceable to operator abuse, such as operating the equipment in conflict with published operating procedures, or improper maintenance, such as substitution of unauthorized replacement parts, use of incorrect lubricants or chemicals, flagrant over- or under-lubrication, and the use of maintenance procedures not conforming with published maintenance instructions, shall be exempted from the scope of the 1-year warranty. Should multiple equipment failures occur in a given item or type of equipment, all equipment of the same size and type shall be disassembled, inspected, modified or replaced, as necessary, and rewarranted for 1 year.

D. Neither the foregoing paragraphs nor any provision in the Contract Documents, nor any special guarantee time limit implies any limitation of the Contractor's liability with the law of the place of construction.

1.2 START-UP OF OPERABLE COMPONENTS

A. Because of the need to maintain operation during construction, it will be necessary to accept and start-up operable components of the project at various times prior to the completion and final acceptance of the entire project.

B. A component of the project, as used herein, shall mean a complete process subsystem and shall include all associated structures, equipment, piping, and controls, etc.

C. When a component of the project has been completed, checked out, field- tested, and made ready for operation, the Contractor shall notify the Engineer in writing that the component is substantially complete and request an inspection for substantial completion. The Engineer will schedule the inspection within 10 days of the Contractor's request. If the Engineer concurs in the Contractor's statement, the Engineer will notify the Contractor in writing that the component is accepted as substantially complete. At the same time, the Engineer will submit to the Contractor a list of items that must be completed or corrected before final acceptance can be given.

D. If a component of the project is needed in order to maintain operation during construction and if it has been accepted as substantially complete, the Contractor shall start up the component when directed by the Engineer. Once the component has achieved stable and satisfactory operation (minimum 95 percent availability over a 7-day period), the Contractor shall request beneficial occupancy by the Owner. The Owner, if he concurs in the Contractor's statement, that stable and satisfactory operation has been achieved, will notify the Contractor in writing within 10 days that he is assuming beneficial occupancy of the component.

E. On the date that the Owner assumes beneficial occupancy, the following shall occur:
   1. The one-year warranties for the component specified in Part 1.01 of this section will begin; and
   2. The Owner will assume responsibility for operating and maintaining the component.

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SECTION 02115

EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

Drawings and other Contract Documents, including General and Supplemental Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes all Contractor provided labor, systems, materials, etc. to provide complete site erosion control in conformance with these specifications as well as all applicable local, State and Federal regulations in sufficient detail to control the spread of wind and water borne materials that would be detrimental to adjoining public or private property, the site, and improvements on the project. These measures shall include the Contractor's construction and maintenance of temporary erosion control features as shown in the plans or as may be directed by the Owner's Representative.

B. The "Operator" as referred to herein or in any regulatory documents or permits shall mean the Contractor.

1.3 REFERENCE STANDARDS

A. Section 104 of the FDOT Standard Specifications, most recent edition.

B. Rule 62-621.300 (4), F.A.C. and the "Generic Permit for Stormwater Discharge from Large and Small Construction Activities", FDEP Document 62-621.300(4) (a).

1.4 SUBMITTALS

A. Prior to the pre-construction meeting, the Contractor shall obtain, prepare and submit the FDEP Form 62-621.300 (4) (b), "Notice of Intent (NOI) to use a Generic Permit for Stormwater Discharge from Large and Small Construction Activities". The type of project or activity that qualifies for use of the Generic Permit, the conditions of the permit, and additional requirements to request coverage are specified in the Generic Permit document (FDEP Documents 62-621.300 (4) (a). The appropriate Generic Permit fee, as specified in Rule 62-4.050 (4) (d), F.A.C., shall be submitted with the NOI in order to obtain permit coverage. Submit a copy of the NOI and confirmation of receipt of the NOI and fee from the NPDES Stormwater Notices Center prior to the pre-construction meeting.

B. The Contractor shall submit to the Engineer a detailed "Erosion and Sediment Control Plan" and "Stormwater Pollution Prevention Plan" (SWPPP) for review. Included shall be plan (s) of the site locating all siltation skirts, hay bales, turbidity curtains, and other features required to control erosion, sediment, water and air pollution, on and off the site. The plan shall be sequenced to show changes during the life of the project; shall be coordinated with on-site

stockpiling of fill and top soil; and shall be directly coordinated with the construction sequence for stormwater improvements. The Contractor shall not start any earthwork or site clearing until the plant is "Owner's" Representative.

C. The plan shall include catalog cuts of all materials provided in support of the plan. The "Erosion and Sediment Control Plan" and SWPPP shall be submitted at or before the preconstruction conferences.

D. At the conclusion of construction and prior to final acceptance by the Engineer, the Contractor shall complete and submit the FDEP Form 62-621.300(6), "Notice of Termination (NOT) of Generic Permit Coverage" in accordance with the instructions contained therein. Submit a copy of the NOT and confirmation of receipt of the NOT from the NPDES Stormwater Notices Center prior to final acceptance by the Engineer.

1.5 PERMANENT EROSION CONTROL

This section is not intended to address the permanent Contractor installed erosion control features such as groundcover, pea gravel, grading, and the installation of drainage structures. It applies only to the temporary efforts required of the Contractor during the full construction process. The Contractor shall incorporate the permanent erosion control features into the project as soon as possible.

PART 2 PRODUCTS

2.1 SILTATION FENCES

The siltation fences shall be geotechnical woven or non-woven fabric conforming to the applicable application requirements of Section 985 of the Florida Department of Transportation "Standard Specifications for Road and Bridge Construction". The type and size of posts and wire mesh reinforcement will be at the option of the Contractor and applicable to the installation conditions.

2.2 EROSION CONTROL MATTING

Erosion control matting shall be woven, biodegradable geotechnical fabric. It shall be used to temporarily stabilize channels or steep slopes until vegetation is established. This type selected shall be comparable to the grass cover applied for the particular installation. The material shall be stapled in place at 18 inches on center with a minimum matting lap of 4 inches.

2.3 HAY OR STAW BALES

Hay and straw bales shall be individual bales each entrenched 4 inches into the soil. The bales shall be clean, fresh hay or straw. Bales shall be replaced when they become clogged with silt, deteriorate, or after a period or 3 weeks, whichever occurs first. The particular application may require that bales be staked into the ground with rebar.

2.4 TURBIDITY CURTAINS

Turbidity curtains shall be floating of sufficient depth to reach within 1.0 feet of the bottom of the receiving water. They shall be similar to the types manufactured by the American Boom and Barrier Corp. They shall yellow or international orange in color. The material shall be 45 mils thick (18 to 22 oz/sq. yd) and fully sewn or vulcanized seamed to provide flexible and buoyant units. The top floatation shall maintain a 3-inch freeboard above the water surface.

PART 3 EXECUTION

3.1 GENERAL

A. The Contractor shall install and maintain all necessary temporary erosion control features for the full period of construction. These features shall be coordinated with all applicable construction features to assure the continuous and effective control of erosion and degradation of surface water quality on and adjoining the site. In the event of unforeseen conditions, the Owner may require the use of control features utilizing methods other than those indicated or proposed by the Contractor.

B. The Contractor shall perform all clearing and grubbing operations such that the area of unprotected erodible earth exposed at any one time is not larger than the minimum area necessary for efficient construction operations, and the duration of exposed, uncompleted construction shall be kept as short as practicable.

3.2 EARTHWORK PROCESS

A. The Owner may limit the area of unprotected erodible earth exposed by clearing, grubbing, excavation, backfilling, or stockpiling operations and may direct the Contractor to provide immediate temporary erosion or pollution control measures to prevent erosion, degradation or receiving water, or windblown transfer of materials. As a result, the Contractor's efforts shall be in keeping with his capability to grade, gravel, and install the permanent erosion control measures.

B. If unforeseen erosion problems arise as a result of the design, weather conditions, or the Contractor's operations, the Contractor shall be required to implement acceptable temporary erosion control features during construction when the Owner so directs.

3.3 TEMPORARY EROSION CONTROL

A. A. General: Temporary erosion and water pollution control features shall consist of, but not be limited to, temporary groundcover, temporary gravel, temporary mulching, sandbagging, slope drains, sediment basins, sediment checks, berms, baled hay or straw, floating turbidity curtain, and silt staked fence. The Contractor may find design details for some of these items in the Water Quality Section of the applicable edition of the Florida Department of Transportation "Department's Roadway and Traffic Design Standards." The Owner's Representative may direct use of temporary erosion control features or methods other than those indicated herein. Any such advice given to the Contractor by the Owner shall not relieve the Contractor from fully preventing erosion.

B. Temporary Groundcover or Gravel: The Contractor may provide temporary gravel or groundcover with mulching to provide temporary erosion control in areas where applicable or where site conditions warrant. The Contractor shall obtain the approval of the Owner for the use of all forms of temporary groundcover. Where temporary groundcover is provided, the final condition of the plant material may warrant its removal and replanting at no additional cost the Owner.
C. Temporary Mulch: This work shall consist of furnishing and applying a 2-inch to 4-inch thick blanket of straw of hay mulch into the top 2 inches of the soil in order to temporarily control erosion. Only undecayed straw or hay, which can readily be cut into the soil, shall be used. Other measures for temporary erosion control such as hydro mulching, chemical adhesive soil stabilizers, etc. may be substituted for mulching with straw of hay if approved by the Owner's Representative. When permanent grassing operations begin, temporary mulch materials shall be plowed under in conjunction with preparation of the ground.
D. Sandbagging: This work shall consist of furnishing and placing sandbags in configurations so as to control erosion and siltation.
E. Slope Drains: This work shall consist of constructing slope drains, utilizing pipe, fiber mats, rubble, cement concrete, asphaltic concrete plastic sheeting, or other acceptable materials, or as may be approved as suitable to adequately perform the intended function.
F. Temporary Sediment Basins: Temporary sediment basins, if necessary, shall be constructed to adequately perform the intended function. Sediment basins shall be cleaned out as necessary to maintain flow function or as directed.

END OF SECTION

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SECTION 02200

EARTHWORK

PART 1 GENERAL

1.1 DESCRIPTION

A. Earthwork includes, but is not limited to excavating, filling, compacting, and grading to obtain the required finished ground surface properly prepared to receive pavements, buildings, and drainage structures.

B. The work includes ditching in ground areas of high water table to allow the soil to drain prior to making excavations.

C. The work includes adjustment of moisture content of soils placed in fills if soil tests show it necessary to allow compaction requirements to be met.

D. The work includes the reduction of all ripable rock materials encountered in the course of the work to the sizes and gradations suitable for placement in rockfills and riprap. Included are all surface boulders as well as ripable rock materials encountered in excavations.

E. The work includes the removal of surface soils into stockpiles and placement of same into designated locations including roadway embankments, drainage areas, curb and island backfills, and roadway shoulders.

F. The work includes construction staking to control earthwork construction.

G. The work includes undercutting unsuitable soil materials and replacing with compacted, approved on-site soils.

1.2 QUALITY ASSURANCE

A. Soil testing will be done on a continuous basis while grading operations are underway.

B. The Contractor shall be solely responsible for all lines, levels and measurements for this work. He shall provide his own instruments and survey crew to maintain this control throughout the duration of his work.

C. Testing and inspecting services will be the responsibility of the Contractor by an independent testing company provided approved by the Owner. When scheduling testing, the Owner requires a minimum of 24 hours' notice with a preferred 48-hour notice prior to testing. Copies of all test reports shall be submitted to the Engineer. The testing company will have an authorized representative on the site to check compaction and determine suitability of fill materials during the grading operations.

1.3 JOB CONDITIONS

A. Erosion control measures shall take place prior to the start of any grading work.

B. Prior to bidding the work, the Contractor shall examine and inspect the construction site as to the nature and location of the work, and the general and local conditions at the construction site; including, without limitation, the character of surface or subsurface conditions and obstacles to be encountered on and around the construction site; and shall make such investigation as he may deem necessary for the planning and proper execution of the work.

C. The Engineer shall be immediately notified if suspected unsuitable foundation or subgrade material is encountered during Contractor's grading activities.

D. A soil report and boring logs have been prepared for this site. This information was gathered solely for the use of the Designers and is not to be used as a basis for calculations in preparing a bid. The use and interpretation of the geotechnical information for any purpose will be entirely the responsibility of the using party. Neither the Owner nor the Engineer gives any guarantee, either expressed or implied; that the borings or geotechnical report represent a true cross section of all the material to be encountered in performing the excavation and earthwork on this project.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

A. Fill materials for embankments shall be clear soil containing no rocks larger than 6 inches and rockfill, if rock is produced by excavating on site.

B. The top 4 inches of all permanently vegetated areas shall be soil material of good quality.

C. Backfill material for structures and retaining walls shall be material obtained off site. Backfill material is subject to approval by the Engineer.

D. Special backfill, where specified, shall be crushed stone or natural or manufactured sand subject to approval of the Engineer.

E. Drainage fill shall be Size #57 crushed stone meeting ASTM C33.

PART 3 EXECUTION

3.1 GRADING

A. Stripping

1. Cut areas and embankment areas shall have all organic topsoil, brush, and other deleterious materials and obvious loose surface materials removed. Undercutting of alluvial soils which exist in drainage features is required.

B. General Grading Requirements

1. For general grading, the finished contours and spot elevations shown on the drawings indicate the finished surface to be obtained by construction. Grades not otherwise shown shall be straight lines between points where elevations are shown. Provide rounding at the top and bottom of slopes and at intersections of planes. Where profiles and typical sections are provided, the profiles and typical sections shall have precedence over the grading plans.
2. Where pavement or building construction is indicated, Contractor shall make due allowance for the thickness of pavement or building structures. Contractor shall note that areas to receive topsoil or riprap are to be left at such grades and elevations that when topsoil or riprap are placed, the finished surface will conform to that shown on Drawing.
3. Grading operations shall be so conducted that materials shall not be removed or loosened beyond the required limits.

C. The finished surfaces shall be left in smooth and uniform planes such as are normally obtainable from the use of hand tools. If the Contractor is able to obtain the required degree by evenness by means of mechanical equipment, he will not be required to use hand labor methods. Slopes and ditches shall be neatly trimmed and finished to slopes shown on the Plans unless otherwise approved by the Engineer in writing.

1. Mass Graded Areas: Finish areas within not more than 0.50 foot above or below the required subgrade elevation provided drainage patterns remain unchanged.
2. Pavements, Buildings, and Drainage Features: Shape surface of areas to line, grade, and cross-section with finished surface not more than 0.10 foot above or below the required subgrade elevation.

3.2 PROOFROLLING

All areas that will support fill, pavement, foundations, or slabs shall be proofrolled with a fully loaded tandem dump truck (or equivalent) to detect soft areas. Proofrolling shall be observed by an experienced Geotechnical Engineer from the testing laboratory hired by the Owner. Proofrolling shall be accomplished by making two complete passes in each of two perpendicular directions. Any areas which exhibit "pumping" (indicating soft spots) shall be undercut to a level specified by the Geotechnical Engineer and replaced with approved fill material compacted in accordance with requirements for fill as specified herein.

3.3 EXCAVATION

A. Excavation consists of removing all materials encountered in establishing required grade elevations, utility installations, and other job requirements. Excavation includes transporting and placing material in embankments, backfills, or temporary stockpiles as required to meet the requirements of the Plans and Specifications.

B. No classification of excavated materials will be made. Excavation and trenching work shall include the removal and subsequent handling of all materials excavated or otherwise removed in the performance of contract work, regardless of type, character, composition, or condition thereof.

C. General Excavation Requirements
   1. Excavation operations shall be managed to ensure proper placement of soil materials not suitable for placement near the surface of embankments. If necessary, the Contractor shall temporarily stockpile excavated earth so that it will be available to top off embankments.
   2. Stability of Excavation: Slope sides of excavations to comply with local codes and ordinances having jurisdiction and with good construction engineering practice. Shore and brace where sloping is not possible either because of space restrictions or stability of material encountered. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.
   3. Dewatering Excavations: Prevent surface water and subsurface or groundwater from flowing into structure excavations.
      a. Do not allow water to accumulate in structure excavations. Remove water to prevent softening of foundations. Provide and maintain sumps, pumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.
      b. Convey water removed from excavations to storm drain system or outfall ditches. Provide and maintain temporary drainage ditches and other diversions outside excavation limits for each structure. Do not use trench excavations as temporary drainage ditches.
   4. Material Storage: Stockpile as directed by Engineer satisfactory excavated materials until required for backfill or fill. Place, grade and shape stockpiles for proper drainage and protect from erosion. Locate and retain soil materials away from edge of excavations.
   5. Excavation for Structures: Conform to the elevations and dimensions shown within a tolerance of plus or minus 0.10 foot and extending a sufficient distance from footings and foundations to permit placement and removal of concrete formwork, installation of services, and other construction required, and for inspection.
   6. Areas of excavation as indicated on the Plans shall be excavated to the limits shown with no classification of excavated material. Excavated rippable rock shall be incorporated in construction of the fills with the method of construction subject to the Engineer's approval. Broken rock resulting from drilling, blasting or other methods may also be utilized in fill construction, subject to Engineer's approval of maximum size of rock, method of construction and areas of placement.

D. Limits of Rock Excavation: Limits are minimum dimensions to which any part of the rock encountered will be allowed to remain.
   1. Beneath pavements, excavate to 6 inches beneath base course.
   2. Beneath structures, excavate 12 inches beneath bottom of structure.
   3. Beneath pipe in trenches, excavated 8 inches beneath the bottom of pipe.

E. Unauthorized Excavation
   1. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of the Engineer.
   2. Unauthorized excavation shall be backfilled and compacted with fill material or special backfill as directed by the Engineer.

F. If the Contractor encounters unsuitable material below subgrade elevation while accomplishing excavation, it shall be removed and replaced as directed by the Engineer. In no case shall objectionable material be allowed in or under the subgrade. Final determination of the classification of any material as unsuitable shall be made by the Geotechnical Engineer and such decision shall be final.

3.4 EMBANKMENT AND BACKFILL CONSTRUCTION

A. Place acceptable and appropriate material in compacted layers to the required subgrade elevations for each area classification to be filled. All materials entering the fill shall be free of organic material, such as leaves, grass, roots and other objectionable material.

B. Embankments
   1. Prior to commencement of grading operations, the Contractor shall proofroll all areas that will receive fill with a fully loaded tandem dump truck. Where quicksand, soft clay, swampy or other material unsuitable for subgrade or foundation purposes is encountered, it shall be removed and disposed of to the level of suitable material. Areas so excavated shall be backfilled with approved material compacted by tamping to the density of the surrounding suitable material and to the lines and grades shown on the Drawings. Unsuitable material will be disposed of within the spoil areas, as designated by the Engineer. Final determination of the classification of any material as unsuitable shall be made by the Geotechnical Engineer and such decision shall be final. In areas that will receive deep fills, the material may remain and be bridged as directed by the Engineer. No additional payment will be made for bridging by using track vehicles only prior to placement and compaction of fill with pans and sheepsfoot rollers.
   2. Rockfill and soils classified other than common excavation may be used only in embankment areas and then in thin layers at the very bottom of fill and more than 8 feet below finished grade and more than 6 feet beneath paving subbase course.
   3. Fills shall be formed of satisfactory materials placed in successive horizontal layers of not more than 6 inches in loose depth for the full width of each strip. A strip shall be defined as being no less than 8 feet wide. Rockfill may be placed in layers up to 12 inches thick in the lower portion of fills unless otherwise approved by the Engineer.

C. Structure and pipe backfill shall be placed in thin layers and compacted to the required minimum densities for fills. Backfill placement shall be balanced to prevent wedging action on structures and pipes.

D. Backfill in storm sewer, sanitary sewer, water line, or any other trenches which lie *under pavement* shall be #57 crushed stone compacted to the required minimum densities for fills and installed according to District specifications.

E. Rockfill shall be placed in embankments from the bottom upward. In no case shall earthfill material be buried underneath rockfill or soils classified other than common excavation. Earthfill material shall be stockpiled as required to allow the total quantity of rockfill to be placed in permissible locations as defined above.

F. In areas where rock or unsuitable soils are excavated to allow construction of pavements, structural fill shall be placed and compacted as shown below.

G. Compaction
   1. General: Control soil compaction during construction providing densities as specified when tested by ASTM 698.
   2. Standard proctor tests (ASTM 698) shall be done in accordance with generally accepted practice by the testing laboratory hired by the Owner for the purpose of comparing field densities to standard proctor test maximum densities unless noted otherwise or instructed otherwise by the Engineer, field density testing. Field density testing should be performed on each lift prior to placement of additional lifts. Test locations should be evenly distributed throughout the fill area and should be performed at the frequencies shown on the following table:

Area	Method of Placement / Completion	Initial Test Frequency	Retest Frequency
General Site	Large self-propelled equipment	1 test per lift per 5,000 square feet	1 test per failed test
Isolated Areas	Hand-guided equipment	1 test per lift	1 test per failed test
Trench backfill and behind retaining walls	Hand-guided equipment	1 test per 50 linear feet per 6 inches of fill	1 test per failed test

   Test frequencies may be increased during the early stages of earthwork construction. Compaction requirements apply to all excavation/backfill operations conducted on site.
   3. Soils shall be placed at a moisture content which is within minus 1 or plus 3 percentage points of the optimum moisture content and to the following percentages of the maximum dry density as determined by ASTM 698:
      a. All Embankments and Backfills: Compact to 95 percent except as hereinafter specified.
      b. Top 12 Inches of Subgrade Under Pavements: Compact to 98 percent.
      c. Top 12 Inches of Subgrade Under Slabs: Compact to 98 percent.
      d. Rockfill shall be compacted by passes of heavy equipment or by drum type vibrating compactors as required to achieve a relative density of 75 percent or as directed by the Engineer.

H. Curbed shoulders and islands shall be backfilled with stockpiled surface soils if available after other uses are completed. Contractor shall place surface soils from stockpiles in a 4-inch minimum thickness layer on all areas designated for planting, grassing, etc.

I. Any areas inaccessible to a roller shall be consolidated and compacted by mechanical tampers. The equipment shall be operated in such a manner that weathered rock, cemented

gravel, clay or other chunky soil material will be broken up into small particles and become incorporated with the other material in the layer.

J. In the construction of filled areas, starting layers shall be placed in the deepest portion of the fill, and as placement progresses, additional layers shall be constructed in horizontal planes. Unless otherwise directed by the Engineer, original slope shall be continuously vertically benched to provide horizontal fill planes. The size of the benches shall be formed so that the base of the bench is horizontal, and the back of the bench is vertical.

K. As many benches as are necessary to bring the site to final grade shall be constructed. Filling operations shall begin on the lowest bench, with the fill being placed in horizontal 6 inch loose lifts unless otherwise authorized by the Engineer. The filling shall progress in this manner until the entire first bench has been filled, before any fill is placed on the succeeding benches. Proper drainage shall be maintained at all times during benching and filling of the benches, to ensure that all water is drained away from the fill area.

L. The Contractor shall be responsible for the stability of all fills made under the contract, and shall replace any portion which, in the opinion of the Engineer or his designated representative, has become displaced due to carelessness or negligence on the part of the Contractor. Fill damage by inclement weather shall be repaired at the Contractor's expense.

3.5 MAINTENANCE

A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion and keep free of trash or debris. Repair and re-establish grades in settled, eroded and rutted areas to specified tolerances.

B. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, remove to sound material, reshape, and compact the required density prior to any further construction.

3.6 EROSION CONTROL

The Contractor shall utilize hay bales and other erosion control devices not only as detailed on the Drawings or required by the Specifications, but at such times and places are as necessary to satisfy local and governmental laws and regulations, to keep silt from washing onto existing paved surfaces, protect culverts or other drainage structures, or as directed by the Engineer.

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SECTION 02575

PAVEMENT RESTORATION

Part I. GENERAL

1.1 Scope

A. The work included under this specification shall include the furnishing of all labor, material, and equipment necessary to satisfactorily restore road surfaces which have been damaged or destroyed during the performance of work under this Contract.

1.2 Referenced Specifications

NOT USED

1.3 Submittals

A. CONTRACTOR shall submit two (2) certified copies of all compaction tests specified below.

Part II. PRODUCTS

A. Pavement material shall be in accordance with the latest Florida Department of Transportation Specifications.

Part III. EXECUTION

3.1 General

A. The CONTRACTOR shall be responsible for temporary restoration of all roadway cuts and for maintaining all cuts in a drivable condition prior to final restoration. All settled areas shall be immediately refilled by the CONTRACTOR.

B. The CONTRACTOR shall be responsible for timely restoration, as determined by the ENGINEER. At no time shall more than 1,200 linear feet of ditch be open without permanent trench restoration.

C. The CONTRACTOR shall give a written notice to the ENGINEER at least 72 hours prior to commencement of resurfacing. If resurfacing will not be accomplished as a single operation, then individual notices shall be given for each section to be resurfaced.

D. The CONTRACTOR shall be responsible for the integrity of the Pavement Restoration for a minimum period of one year following the acceptance of the project.

E. At least every three months, the CONTRACTOR shall provide a complete overlay of all roads that have achieved final restoration.

3.2 County/CITY Secondary Road Crossings

A. Secondary road crossings which are open cut in areas where resurfacing is required shall be restored with a minimum of 12 inches of compacted limerock or shell base material or 8 inches of flowable fill.

B. Secondary road crossings made in unpaved and/or unsurfaced areas are to be restored in accordance with the details shown on the plans. Sufficient amount of approved material to be distributed on the roadway to provide a condition equal or greater than the condition of the road which existed prior to the commencement of construction.

3.3 Private Roadways

A. Private road crossings which are open cut in areas where the roadway is surfaced with bituminous material shall be restored in accordance with the details shown on the plans.

B. Private road crossings which are open cut in unpaved areas shall be restored in accordance with the details shown on the plans. Sufficient amounts of approved material shall be distributed on the roadway in such a manner as to leave the roadway in a condition substantially equal to that which existed prior to the commencement of construction.

3.4 Compaction and Testing

A. State, County and private road crossings which are open cut shall be compacted and tested as described herein.

B. Backfill below the road base material shall be compacted as shown on the plans for a Type "A" Trench.

C. Road base material shall be replaced and compacted in two or three layers, to attain a thickness of two (2) times the original base material thickness or a minimum of 12". Limerock, and Shell Bases shall be compacted to the density shown on the Plans.

D. The CONTRACTOR shall obtain a testing company to perform the required compaction density tests. The testing firm must have the approval of the ENGINEER prior to the commencement of construction. Each crossing must have two (2) tests performed on the compacted subgrade, and two (2) tests performed on the compacted base, at a minimum separation of 1/3 the traversed roadway distance. If any tested work fails to meet the specified compaction requirements, the testing company shall determine the extent of the faulty work, and all faulty work shall be re-excavated and replaced in accordance with this section, and the tests shall be repeated until specified requirements are met. Test data shall be submitted to the ENGINEER and approved by the ENGINEER prior to resurfacing of asphalt concrete roads.

3.5 Approvals

A. The work under this specification will not be considered complete nor satisfactory until approved by the ENGINEER as well as the applicable governmental agency.

END OF SECTION 02575

DIVISION 15: MECHANICAL

SECTION 15001

PIPE WORK GENERAL PROVISIONS

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

A. Work under this Section includes all material certificates; Shop Drawings; disinfection of potable water mains; and field testing of all pipe, pipe fittings, piping specials, and valves in all sections necessary to complete and make serviceable all piping systems.

B. The requirements of this Section apply to the work in the following Sections:
   1. Section 15001, Pipe Work General Provisions
   2. Section 15064-A, PVC Pressure Pipe
   3. Section 15090, Pipe Couplings and Expansion Joints
   4. Section 15105, HDPE Pipe

1.2 QUALITY ASSURANCE

A. Codes and Standards: Comply with the provisions of the following codes and standards except as otherwise shown or specified.
   1. AWWA: All applicable standards.
   2. Florida Department of Environmental Protection: All rules and regulations.

1.3 SUBMITTALS

A. Material Certificates: Provide materials certificates signed by the material manufacturer and the Contractor for all pipe and pipe fittings. Certify that each material item complies with the specified requirements.

B. Shop Drawings: Submit Shop Drawings for all valves and special items, restrained joint systems for all systems, and laying schedules in accordance with Section 01340 of these Specifications.

PART 2 PRODUCTS

2.1 TEST RESULTS

The Contractor shall conduct all tests in the presence of the Engineer. Test results shall be certified to the Owner in writing.

2.2 TESTING OF PRESSURE PIPING SYSTEMS

A. Each section of piping shall be tested to a hydrostatic pressure of 150 psi (minimum) or 50 psi above the working pressure. The Contractor is required to furnish all pumps, gauges, instruments, test equipment, and personnel required for the tests, and make provisions for removal of test equipment and draining of pipes after tests have been made. All testing shall be made in the presence of the Engineer.

B. The pressure tests shall be sustained for not less than two hours and as long as the Engineer may require to assure that:
   1. No air pockets are in the line.
   2. No broken pipe or defective materials are in the line.
   3. No leaking joints have been made.

C. Before applying the specified test pressure, all air shall be expelled from the pipe. If outlets are not available at high places, the Contractor shall make the necessary taps at points of highest elevations before the test is made. After the test has been completed, corporation cocks shall be installed at these points and marked by the installation of a valve box.

D. Tests may be made of isolated portions of such piping as will facilitate general progress of the installation. Any revisions made in the piping systems will subsequently necessitate retesting of such affected portions of the piping systems.

E. Where city water service is available, reasonable amounts of water for flushing and testing will be furnished by the Owner at no cost to the Contractor subject to requirements which the Owner may impose.

F. Any defective material or defects in workmanship that become apparent during the tests shall be remedied and the subject piping shall be retested.

G. Prior to pressure testing of buried piping, backfill shall have been partially placed and tamped to provide adequate side support for all pipe and fittings. At joints, trenches shall be sufficiently open for joint inspection.

H. All piping systems shall be thoroughly flushed by providing a velocity of $2^1/_2$-feet per second in the line being flushed.

I. Do not test against closed valves at pressures higher than the allowable seating pressures for individual valves. Contractor may test open valves at pressures up to that specified for the valve bodies. In sections of the line where the test pressures are greater than the allowable seating pressures for the valves, the Contractor shall provide temporary plugs to test against.

J. The leaking tests which may be performed at the same time as the pressure tests shall be sustained for not less than 2 hours. The leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe or any valved section thereof to maintain the specified leakage test pressure after the air in the pipe line has been expelled and the pipe has been filled with water.

K. No pipe line installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{NDP^{0.5}}{7400}$$

L = allowable leakage in gallons per hour
N = number of joints in length of pipe line tested
D = nominal diameter of pipe in inches
P = average test pressure during leakage test in pounds per square inch

2.3 TESTING GRAVITY FLOW PIPING

A. General:

1. The following procedures apply only to the storm drainage systems. Tests for this piping may be waived at the Engineer's discretion.
2. Field testing of gravity flow pipes, including manholes, for joint integrity and water tightness shall be conducted by either an infiltration test or an exfiltration test. The Contractor shall furnish all plugs, pumps, piping, gauges, timers, instruments, required test apparatus, and all labor required for installing the testing equipment, conducting the test, and removing the testing apparatus after the tests have been completed. All testing shall be done in the presence of the Engineer.
3. The Engineer will determine the type of test required for each section after the ground water table has been measured by the Contractor. The following general criteria will govern the type of test to be conducted.
   a. Wherever the ground water table is measured to be not less than 1 foot above the top of the pipe throughout the full length in the section being tested, an infiltration test shall be used.
   b. Wherever the ground water table is measured to be less than 1 foot above the top of the pipe at the highest point in the section being tested, an exfiltration test shall be used.

B. Measuring Ground Water Table:

1. The Contractor shall provide facilities for measuring the ground water table at intervals equal to and not greater than the manhole spacing, etc., one probe per manhole.
2. Maximum allowable leakage permitted under this Specification is 25 gpd/inch of pipe diameter/mile for sanitary lines and 100 gpd/inch of pipe diameter/mile of pipe for storm water systems. The permissible leakage rate is established for either the infiltration or exfiltration test.
3. Testing, whether for infiltration or exfiltration, is to be performed by standard methods and are to be approved by the Engineer prior to conducting the tests.

C. Testing Gravity Flow Lines by Visual Inspection: All gravity flow sewers 18 inches diameter and smaller shall be subject to testing by visual inspection for alignment and grade. A section of pipe between two manholes will have passed the test when a light held in a manhole will show a full circle when viewed from an adjoining manhole through the carrier pipe. Visual inspection is in addition to I/E tests.

D. Failures: If, for any reason, a section of pipe fails either of the tests previously outlined or any substitute test procedure approved by the Engineer, the Contractor shall locate the defective

materials and/or installation and make any necessary repairs. After the corrective actions have been taken, the section of pipe shall be retested subject to the same provisions or requirements outlined above.

2.4 RELATIONSHIP OF SEWERS TO WATER MAINS

A. Sewer Parallel to Water Main: Sewers shall be located, during design, at least 10 feet horizontally from any existing or proposed water main. If, for absolutely essential reasons, it is not possible to achieve such separation, the sewer may be located not less than 3 feet from a water main - horizontally, provided there is at least 18 inches vertical separation between the bottom of the water main and the top of the sewer, with the sewer below the water main.

B. Vertical Separation: Whenever sewers must cross under water mains, the sewer shall be laid at such an elevation that the top of the sewer is at least 18 inches below the bottom of the water main. When the elevation of the sewer cannot be buried to meet the above requirement, the water main shall be relocated to provide this separation or reconstructed with slip-on or mechanical-joint ferrous pipe for a distance of 10 feet on each side of the sewer. One full length of water main pipe should be centered over the sewer so that both joints will be as far from the sewer as possible.

C. Special Conditions: When it is impossible to obtain proper horizontal and vertical separation as stipulated above, the water main should be constructed of slip-on or mechanical-joint ferrous pipe and the sewer constructed of mechanical-joint ferrous pipe and both services should be pressure tested to assure watertightness.

D. Must meet all applicable Florida Department of Environmental Protection and local codes and regulations.

END OF SECTION

SECTION 15010

BASIC MECHANICAL REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES:

Basic mechanical requirements specifically applicable to Division 15 Sections, except as otherwise specified in these sections.

1.2 SYSTEM COMPLETENESS

Provide systems complete, workable and ready for operation. Make all corrections as required from engineers or building officials' construction review comments.

1.3 SUBMITTALS

A. Provide sets of submittals for HVAC equipment, plumbing fixtures, controls, insulation, test and balance, etc. in accordance with architectural requirements. Contractor providing submittal shall neatly organize and bind divider tabs by specification section. Submittals shall be reviewed by engineer. Equipment and materials not specified or manufacturers not listed shall require 10 day prior approval. Submittal reviews beyond two shall be subject to a professional service penalty to engineer at $75/hour.

B. Certificates
   1. Proof of compliance.
   2. Submit proof that materials or equipment specified comply with requirements of independent agencies such as Underwriters Laboratories Inc. (UL), American National Standards Institute, Inc. (ANSI), Air-Conditioning and Refrigeration Institution (ARI), American Society of Heating, Refrigeration and Air-Conditioning Engineers, Inc. (ASHRAE), and Air Movement and Control Association, Inc. (AMCA). Label or listing of specified agency is acceptable as evidence of compliance, or Contractor may submit a written certification from an approved, independent, nationally recognized testing laboratory that is adequately equipped and competently staffed to perform the required services. Provide certification, listing items tested and specific, applicable requirements of tests required by specific agency.

1.4 ELECTRICAL WORK

A. HVAC contractor shall provide HVAC equipment specified herein complete with motors and contactors, and controls.

B. Provide manual or automatic control and protective or signal devices required for operation specified or indicated.

C. Provide control wiring required for control devices but not shown on the electrical plans.

D. Provide additional electrical work required by mechanical equipment substitutions under Division 15.

E. All equipment provided with 3-phase power supply shall have balanced loads to within 5 percent on each leg.

1.5 STANDARD PRODUCTS

Unless otherwise indicated or specified, provide standard products of manufacturers regularly engaged in production of such equipment and provide the manufacturer's latest design. Provide all items of the same type or rating identical.

1.6 DELIVERY, STORAGE, AND PRODUCT HANDLING

A. Deliver, store, and protect and handle products to site per manufacturer's instructions per architectural requirements.

B. Repair or replace equipment with dents and other surface damage. Repair painted surfaces previously accepted by owner.

1.7 ON-SITE CONFERENCES AND ON-SITE TESTING

Notify engineer and owner for on-site conferences and on-site review and tests. Apply these requirements to the following:

A. Inspection of work above ceiling before ceiling installation.

B. Final tests and demonstrations of mechanical systems.

C. Review meeting on temperature control system.

D. Inspection and verification of duct pressure tests and test and balancing.

1.8 COORDINATION OF WORK

A. Other Trades
   1. Coordinate mechanical work with other trades involved in the construction project. Provide drops, rises, or offsets not indicated but necessary for proper installation of work. Carefully lay out all work in advance to coordinate with architectural, structural, mechanical, and electrical features of construction. Verify at site all locations, grades, elevations, and utility service connections indicated. Make required changes or relocations necessary to resolve any conflicts.
   2. Contractor shall coordinate all work with the owner so as to reduce as much as possible to effect that all construction might have on day-to-day activities.

B. Drawings - The Drawings indicate extent and general arrangement of equipment, piping, and ductwork. Request approval for any departures deemed necessary. Make no departure without written approval.

C. Clearances - Fit equipment into space allotted and allow adequate clearances for entry, installation, replacement, servicing, and maintenance. Coordinate work to ensure equipment may be moved into place without altering building components or other installations. Provide access space not less than the equipment manufacturer's requirements.

D. Above Ceilings - Completely install, test, and approve mechanical work located above ceilings prior to installation of finished ceilings. Prior to inspection, ceiling suspension system may be installed as required for coordination with mechanical work.

PART 2 PRODUCTS

All equipment shall be per specifications. Approved equals to quality of basis of design shall be considered with 10 day prior approval. Products by manufacturers not listed as approved shall be rejected.

PART 3 EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Provide final connections to equipment, including pipe, duct, and temperature controls, under applicable sections of this Division, unless otherwise specified or indicated. Contractor shall follow construction documents. Reports shall be made by engineer at each construction review. If contractor fails to comply with installation requirements of equipment duct sealing, controls, insulation, etc., corrections shall be made to comply with design documents. Insufficient submittal or construction review beyond three chances to comply shall be subject to a professional service penalty to engineer at $80/hour.

B. Manufacturer's Instructions - Install equipment as recommended by manufacturer to conform to requirements of the particular application, in accordance with Drawings and Specifications.

3.2 FOUNDATIONS, BASES, AND SUPPORTS

Properly support equipment, ductwork, and piping. Provide required frames, braces, hangers, anchors, and supports.

A. Suspended Equipment
   1. Brace and support suspended equipment inside buildings to provide a rigid installation.
   2. Provide steel supports attached to bearing walls or roof or floor support framing members only.
   3. Do not attach supports to metal roof decks and do not penetrate cellular floor decks.
   4. Provide cross bracing as required.

3.3 LUBRICATION

A. Lubricate equipment in accordance with equipment manufacturer's instructions before it is initially operated.

B. Check equipment and relubricate during construction and directly before final acceptance.

3.4 ADJUSTMENTS AND PRELIMINARY TESTS

Before equipment is started and systems are used, clean piping, ductwork, and equipment and perform the following adjustments and preliminary tests.

A. Fans and Air-Handling Units
   1. Check for freedom of movement of fan wheel, bearing lubrication, and cleanliness.
   2. Before air balancing is begun, check all fans for proper direction of fan wheel rotation by "bump-starting" each fan individually.

B. Dampers and Associated Equipment - Before air balancing is begun, visually check, adjust, and correct the following:
   1. Damage to coil fins and sensing elements.
   2. Damper clearances.
   3. Damper seating.
   4. Freedom of damper movement.
   5. Position of blades versus quadrant indication.
   6. Movement of fire dampers.
   7. Location, access to, and fitting of fusible link assemblies.
   8. Installation and securing of turning vanes.
   9. Flexible Connections.
   10. Before the system is filled, check pipe alignment at flexible connections by loosening the flange bolts or threaded fitting and noting the offset between mating surfaces.
   11. Eliminate any offset by re-piping as required.
   12. Replace any damaged connector.

C. Static Pressure and Other Testing Requirements - Other testing requirements of piping and ductwork systems specified in this Division are described in the applicable sections.

3.5 OPERATING INSTRUCTIONS

A. After equipment and services are in operation, the operation and maintenance data are available, and prior to substantial completion, conduct an instruction and training session for the Owner's operating personnel.

B. Conduct instruction sessions during the Owner's normal working periods, and at times and locations satisfactory to Owner. Whenever deemed applicable by the Owner, instruction period may be divided into two 4-hour sessions, 1 session during heating season and 1 session during cooling season.

C. Provide the following instruction and demonstration of operation:
   1. Temperature and Associated Controls. Provide instruction and demonstration for operation and maintenance given by competent factory-trained service and operating personnel from the appropriate manufacturer. Record names of personnel present at each training session.

3.6 EQUIPMENT START-UP

Do not place equipment in operation until it has been cleaned as required by 3.7 below, inspected by a qualified representative of the manufacturer and is certified to be ready for operation. Manufacturer's representative shall supervise the startup operation and shall be responsible for all adjustments required to meet design conditions.

3.7 CLEANING

Clean ductwork and equipment prior to application of paint or coverings. Prior to substantial completion, provide the cleaning as follows:

A. Cleaning of Exterior Surfaces
   1. Remove all traces of dust, dirt, paint overspray, debris, etc. from exterior surfaces of ductwork and equipment.
   2. Wash and wipe, using solvent or detergent as required.
   3. Repair damage occurring to equipment before final acceptance.
   4. Replace equipment if suitable repairs cannot be made.
   5. Restore factory-finished items to like-new condition.
   6. Cleaning of Interior Surfaces
   7. Clean inside of plenums, casings, and ductwork free of construction debris.
   8. Provide new filters in air-handling units after cleaning is complete.
   9. Do not operate air-handling units for testing or any other purpose unless filters are installed.
   10. Replace or patch torn insulation as required.
   11. Wipe clean and wash down coil fin surfaces and fan blades.
   12. Straighten damaged coil fin surfaces with standard coil fin combing tools.

3.8 FINAL TESTS AND DEMONSTRATIONS

Upon completion of the work, but prior to substantial completion, demonstrate operation of mechanical systems. If any system does not perform satisfactorily, make adjustments and corrections until satisfactory operation is achieved.

END OF SECTION

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SECTION 15064-A

PVC PRESSURE PIPE

PART 1 GENERAL

1.1 SCOPE

A. The work covered by this section includes furnishing all labor, equipment, and materials required to install and test polyvinyl chloride (PVC) pressure pipe, including valves, unions, fittings, couplings, adaptors, and accessories, as shown on the Drawings and/or specified herein.

B. The Contractor's attention is called to the fact that all PVC piping and accessories are not necessarily shown completely on the Drawings which are more or less schematic. However, the Contractor shall furnish and install all piping indicated or required for proper operation of the equipment or services requiring such piping.

1.2 QUALITY ASSURANCE

A. The Contractor, at the Engineer's request, shall furnish a certificate from the manufacturer of the pipe and fittings that the manufacturer is fully competent and capable of manufacturing PVC pipe and fittings of uniform texture and strength that will fully comply with these specifications and have so manufactured this class of pipe in sufficient quantities to be certain that it will meet all normal field conditions of usage. The manufacturer must have adequate equipment and quality control facilities to be sure that each extrusion of pipe is uniform in texture, dimensions, and strength.

B. All pipe shall be tested and inspected at the place of manufacture for all requirements of the latest ASTM and commercial standard tests and certified copies of the test reports covering each shipment shall be submitted to the Engineer prior to laying.

C. Each length of pipe and each fitting shall have the following data clearly marked on each piece:
   1. Nominal size
   2. Type and grade of material and ASTM standard
   3. SDR, class, or schedule rating
   4. Manufacturer
   5. National Sanitation Foundation's seal of approval

1.3 SHOP DRAWINGS AND ENGINEERING DATA

Complete shop drawings and engineering data shall be submitted to the Engineer in accordance with the requirements of the section entitled "Submittals" of these Specifications.

1.4 STORAGE AND PROTECTION

A. PVC piping and accessories shall be stored and protected in accordance with the requirements of these Specifications.

B. PVC pipe and fittings shall be stored under cover.

C. All pipe and accessories shall be stored aboveground and fully supported so as not to bend or deflect excessively under its own weight. Height of stacked pipe shall not exceed 4 feet. Bundled pipe shall not be stacked more than two bundles high.

D. Kinked, flattened, buckled, broken, or otherwise defective pipe and fittings shall not be used and shall be removed from the site.

E. Pipe shall be handled using nylon slings. Wire rope slings or chains shall not be

used. 1.5 GUARANTEE

Provide a guarantee against defective equipment and workmanship in accordance with the requirements of the section entitled "Guarantees and Warranties" of these Specifications.

PART 2 PRODUCTS

2.1 PVC PIPE AND FITTINGS

A. The pipe and fittings shall be homogenous throughout and free from visible cracks, holes, foreign inclusions, or other injurious defects. The pipe shall be as uniform as commercially practical in color, opacity, density, and other physical properties.

B. The manufacturer shall provide waterstops, acceptable to the Engineer, which shall be applied to the outside of plastic pipe when the pipe is to be enclosed in any structure where concrete or mortar is used which will prevent leakage along the outer wall of the barrel of the pipe.

C. No single piece of pipe shall be laid on any project covered by this specification unless it is found to be generally straight. Such pipe shall have a maximum ordinate as measured from the concave side of the pipe not to exceed 1/16-inch per foot of length. If the deviation from straightness exceeds this requirement, then the particular piece of pipe shall be rejected for use until it can comply with this provision.

D. Wyes, tees, bends, and adapters and any other fittings required or directed by the Engineer shall be constructed of ductile iron as directed in Section 15062 of these Specifications. Engineering data for such fittings showing cross-sectional views with dimensions shall be provided and such data and fittings shall be approved by the Engineer prior to their use. The materials used in the manufacture of fittings shall conform with the requirements for the pipe with which they shall be used and any variation of such requirements shall be subject to the approval of the Engineer. Fittings shall have wall thicknesses equal to or greater than that of the pipe to which they are joined.

2.2 PIPE

A. PVC pipe shown on the Drawings to be installed outside of structures or buried underground and used to convey water or wastewater shall have push-on joints unless otherwise noted on the Drawings. All pipe material shall be Grade 1, Type I, polyvinyl chloride (PVC) in accordance with ASTM D 1784, Class 12454-B. All pipe material shall be National Sanitation Foundation approved for use with potable water. Pipe in sizes $1^1/_2$-inches through 3 inches (1/2 inches through 12 inches for corrosive fluids) shall be SDR 21 with 200 psi pressure rating in accordance with ASTM D 2241. Pipe in sizes 4 inches through 12 inches shall be either SDR 21 with 200 psi pressure rating in accordance with ASTM D 2241 or Class 200 in accordance with AWWA C 900, depending on which is called for on the Drawings or in the Bid Schedule. Maximum lengths of pipe shall not exceed 20 feet.

B. PVC pipe shown on the Drawings to be installed inside of structures or used to transport liquid or gaseous chlorine shall have threaded joints. Solvent welding of field joints will not be permitted. PVC for threaded joints shall be Schedule 80, National Sanitation Foundation approved and shall conform to the latest requirements of Commercial Standard CS 207 and ASTM D 1785 for Schedule 80 water pressure ratings. Pipe material shall be Type I, Grade 1, in accordance with the requirements of ASTM D 1784, Class 12454-B. Fittings shall comply with the requirements of ASTM D 2464 for molded, Schedule 80, screwed fittings.

C. When operating temperatures exceed 140°F, pipe material shall be chlorinated polyvinyl chloride (CPVC) in accordance with ASTM D 1784, Type IV, Grade 1, Class 23477-B.

2.3 FITTINGS

A. All fittings required in PVC piping systems conveying water or wastewater shall be cast iron or ductile iron as specified in these Specifications. Engineering data for fittings showing cross-sectional views with dimensions shall be provided and such data and fittings shall be approved by the Engineer prior to their use. Connections between cast iron or ductile iron fittings and PVC pipe shall be made by use of special adaptors similar to Mueller Transition Gland A-399 by Mueller Co., Transition Gasket F6340 by Clow Corporation or a similar transition which has been approved by the Engineer. The joint shall be mechanical joint for ductile iron or cast iron as described in Section 15062 of these Specifications.

B. Fittings for PVC pipe inside of structures or used to convey liquid or gaseous chlorine shall comply with the requirements of ASTM D 2464 for Molded, Schedule 80, screwed fittings.

2.4 PVC VALVES AND STRAINERS

A. Unless otherwise shown or required, all valves, unions, and strainers in PVC piping shall be constructed of Type I, Grade 1 PVC. Valves shall be NSF approved and shall have a working pressure of 150 psi.

B. Ball valves shall have double union type body, Teflon seats, Viton seals, full diameter port, and NPT threaded ends. Ball valves in 4-inch size may have single union body.

C. Check valves shall be of the ball type with union body, Viton seat, and NPT threaded ends.

D. Strainers shall be of the wye type with NPT threaded ends and 8 or 10 mesh strainer basket.

2.5 JOINTS

A. Push-On Joints

1. The joints shall be designed so that the pipe and fittings may be connected on the job without the use of solvent cement or any special equipment. The push-on joint shall be single rubber gasket joint designed to be assembled by the positioning of a continuous, molded, rubber ring gasket in an annular recess in the pipe or fitting entering pipe into the socket thereby compressing the gasket radially to the pipe to form a positive seal. The gasket and the annular recess shall be so designed and shaped that the gasket is locked in place against displacement as the joint is assembled. Details of the joint design and assembly shall be in accordance with the joint manufacturer's standard practice. The joints shall be designed so as to provide for the thermal expansion or contraction experienced with a total temperature change of at least 75°F in each joint per length of pipe. The joint shall comply with ASTM D 3139. Gasket shall comply with ASTM F 477.
2. Lubricant furnished for lubricating joints shall be nontoxic, shall not support the growth of bacteria, shall have no deteriorating effects on the gasket or pipe material, and shall not impart color, taste, or odor to water. The lubricant containers shall be labeled with the manufacturer's name.
3. Gaskets shall meet all applicable requirements of ANSI A21.11. Gasket dimensions shall be in accordance with the manufacturer's standard design dimensions and tolerances. The gasket shall be of such size and shape as to provide an adequate compressive force against the spigot and socket after assembly to affect a positive seal under all combinations of joint and gasket tolerances. The trade name or trademark, size, mold number, gasket manufacturer's mark and year of manufacture shall be molded in the rubber on the back of the gaskets.
4. Gaskets shall be vulcanized natural or vulcanized synthetic rubber. No reclaimed rubber shall be used. When two hardnesses of rubber are included in a gasket, the soft and hard portions shall be integrally molded and joined in a strong vulcanized bond. They shall be free of porous areas, foreign material, and visible defects. The required properties of the gasket rubber and the required method of test are given in the following table:

ASTM Test Property	Method	Main Body of Gasket	Harder Portion (if used)
Hardness, Durometer "A"	D 676 at 76” 6°F	45-70	78-90
Minimum Ultimate Tensile, psi	D 412	2,000	1,200
Minimum Ultimate Elongation, Percent[1]	D 412	300	125
Minimum Aging, Percent[2]	D 572[3]	60	60

[1] Of original length.

[2] Of original values of tensile and ultimate elongation.

[3] Oxygen pressure method: After 96 hours at 70 "1°C at 300 +10 psi.

5. The gasket manufacturer shall set up such quality control procedures as will ensure the gasket's meeting the requirements of this standard. He shall furnish a monthly report of representative quality control test results to the pipe manufacturer.
6. A sample push-on fitting shall be submitted to the Engineer for examination and approval prior to delivery of any pipe.

B. Threaded Joints
1. Joints shall be made with American Standard IPS threads. All joints shall be made up with Teflon thread tape or thread dope or with pipe manufacturers recommended joint compound for use with chlorine solution.
2. All fittings shall be Schedule 80 with screwed joints. Gaskets for flange fittings and unions shall be as recommended by pipe manufacturer for use with chlorine solution.

PART 3 EXECUTION

3.1 LAYING PIPE

A. All provisions with respect to trenching, backfilling, bedding, and pipe laying shall conform to the applicable requirements of the section entitled "Earthwork" of these Specifications.

B. All provisions with respect to connections and existing utilities shall comply with the applicable requirements of these Specifications.

C. Exposed piping shall be supported in accordance with the requirements of these Specifications. Metal valves and valve boxes shall be supported independently of piping. PVC piping shall be isolated from direct contact with metal or concrete supports by a 1/32-inch sheet of neoprene.

D. When a joint consists of a PVC flange and a metal flange, the metal flange shall be flat faced and furnished with a full face resilient gasket.

E. PVC valves shall be installed with the flow arrow in the proper direction. Union nuts on PVC valves shall be tightened only hand tight in accordance with manufacturer's instructions. Spare O-ring seals and seats shall be furnished with each PVC valve.

F. Where specifically shown or called for on the Drawings, service line taps into PVC pipe shall be made using tapping saddle constructed for use on PVC pipe. The saddle shall be constructed of bronze or brass, shall have all stainless steel bolts or screws, and have a resilient rubber gasket to provide a positive, watertight seal.

G. PVC pipe laid underground shall have a minimum of 36 inches of cover in traffic areas and 30 inches of cover in non-traffic areas.

3.2 FIELD TESTING

A. After all piping has been placed and backfilled between the joints, each run of newly laid pipe, or any valved section thereof, shall be tested by the Contractor in the presence of the Engineer, and tests shall be continued until all leaks have been made tight to the satisfaction of the Engineer.

B. All piping shall be subject to a hydrostatic gauge pressure equal to the rated pressure class of the pipe being tested. The allowable leakage shall be as shown in Table 1. The duration of the test shall be a minimum of 2 hours.

C. The Contractor shall take all precautions necessary to protect any equipment that might be damaged by the pressures used in the tests. Delicate equipment shall be valved off, removed, or otherwise protected.

D. All piping shall be securely anchored and restrained against movement prior to application of test pressures. Prior to the pressure test, pipe laid in trenches shall be partially backfilled adequately to secure the pipe during the test. All joints, fittings, and valves will be left open where possible. All exposed pipe, fittings, valves, and joints shall be carefully examined during the pressure test.

E. Before applying the specified test pressure, all air shall be expelled from the pipe. If hydrants, blow-off valves, or air release valves are not available at the high places, the Contractor shall make the necessary taps at points of highest elevation before the test is made and insert plugs after the test has been completed.

F. Any excessive leakage developing during the test shall be corrected at the Contractor's expense. If the defective portion cannot be located, the Contractor, at his expense, shall remove and reconstruct as much of the original work as necessary to obtain a facility meeting the specified leakage limits.

G. After all tests on any section have been completed to the satisfaction of the Engineer, the Contractor shall carefully clean, blow out, and drain the line of all water to prevent the freezing of the same. The Contractor shall also demonstrate to the satisfaction of the Engineer that any and all lines are free from obstructions and foreign material.

H. The Contractor shall bear the complete cost of the tests, including set-up, labor, temporary piping, blocking, gauges, bulkheads, water, air, soap solutions, and any other materials required to conduct the tests.

I. All pipe used for gaseous chlorine shall be tested with ammonia solution as recommended by the manufacturer of the chlorination equipment.

TABLE 1

ALLOWABLE LEAKAGE
(U.S. Gallons per 100 Joints per Hour)

Pipe Diameter (inches)	Test Pressure (psi)			
50	50	100	150	200
4	0.35	0.50	0.60	0.75
6	0.53	0.75	0.90	1.10
8	0.70	1.00	1.20	1.40
10*	0.88	1.25	1.50	1.75
12*	1.05	1.50	1.80	2.10

*Single-gasket coupling is one joint. Twin-gasket coupling is two joints.

3.3

FIELD PAINTING

After installation, all exposed piping shall be field primed and painted in accordance with the requirements of these Specifications.

END OF SECTION

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SECTION 15090

PIPE COUPLINGS AND EXPANSION JOINTS

PART 1 GENERAL

1.1 SCOPE

The work covered by this section includes furnishing all labor, equipment, and materials required to furnish and install pipe couplings and expansion joints, including grooved couplings, flanged adaptors, expansion couplings, and rubber expansion joints, as shown on the Drawings, specified herein, and/or required for proper installation of piping and equipment.

1.2 SHOP DRAWINGS AND ENGINEERING DATA

Complete shop drawings and engineering data shall be submitted to the Engineer in accordance with the requirements of the section entitled "Submittals" of these Specifications.

1.3 STORAGE AND PROTECTION

Pipe couplings shall be stored and protected in accordance with the requirements of these Specifications.

1.4 SHOP PAINTING

Pipe couplings shall be cleaned, shop primed, and shop painted as specified herein.

1.5 GUARANTEE

Provide a guarantee against defective materials and workmanship in accordance with the requirements of the section entitled "Guarantees and Warranties" of these Specifications.

PART 2 PRODUCTS

2.1 EXPANSION COUPLINGS

A. Unless otherwise shown or specified, expansion couplings shall be of a gasketed, short sleeve type, with a diameter to fit the pipe properly. Expansion couplings shall have a working pressure of not less than 150 PSIG.

B. Each short sleeve coupling for joining cast iron or ductile iron pipe shall consist of one cylindrical cast iron middle ring without pipe stop, two high-grade malleable iron or steel followers, two rubber compound, wedge section gaskets, and a sufficient number of track head, electroplated steel bolts to compress the gaskets properly. Cast iron couplings shall be Dresser Style 53, Rockwell Style 441, or equal.

C. Each short sleeve coupling for joining steel pipe shall consist of one cylindrical steel middle ring without pipe stop, two steel follower rings, two rubber-compound, wedge section gaskets, and a sufficient number of track head, electroplated steel bolts to compress the gaskets properly. Steel couplings shall be Dresser Style 38, Rockwell Style 411, or equal.

D. Where expansion couplings are required for joining cast iron pipe to steel pipe of the same nominal size, steel transition couplings, Dresser Style 62, Rockwell Style 413, or equal, shall be used.

E. Rubber gaskets shall be composed of a resilient synthetic rubber compound suitable for use in wastewater containing oil and grease.

2.2 GROOVED COUPLINGS

A. Grooved couplings for cast iron and ductile iron pipe shall consist of two or more ductile iron housing clamps, a single rubber compound gasket, and electroplated oval-neck track bolts with heavy hex nuts. Housing shall be ribbed for strength and self-centering. Rubber gasket shall be composed of a resilient synthetic rubber compound suitable for use in wastewater containing oil and grease.

B. Grooved couplings shall provide for a pipe end separation of not less than 3/32-inch and a deflection of not less than 0°45'.

C. Grooved couplings shall engage two circumferential grooves cut at the ends of the pipe sections to be joined. The grooves shall provide a positive mechanical grip that locks the pipe ends together such that they cannot blow apart under pressure, vibration, or sag. Grooves shall be cut with a radius at the inside corners of the grooves.

D. Grooved couplings for joining cast iron or ductile iron pipe shall be Vitraulic Style 31, Gustin-Bacon Gruvajoint No. 500, or equal.

2.3 FLANGED ADAPTORS

A. Flanged adaptors shall be used for joining plain end cast iron or ductile iron pipe to flanged valves, pumps, and fittings. Flanged adaptors shall be suitable for working pressures to 150 PSIG.

B. Flanged adaptors in sizes 12-inch and smaller shall consist of an ASTM A 126, Class B cast iron flanged body drilled to mate with a 125-pound cast iron flange per ANSI B16.1, a cast iron follower ring, a rubber-compound, wedge section gasket, and a sufficient number of track head, electroplated steel bolts to compress the gasket properly.

C. Flanged adaptors in sizes 14-inch and larger shall consist of a high strength steel flanged body drilled to mate with a 125-pound cast iron flange per ANSI B16.1, a high strength steel follower ring, a rubber-compound, wedge section gasket, and a sufficient number of electroplated steel bolts to compress the gasket properly.

D. Rubber gasket shall be composed of a resilient synthetic rubber compound suitable for use in wastewater containing oil and grease.

2.4 FLANGED RUBBER EXPANSION JOINTS

A. Flanged rubber expansion joints shall be standard spool-type single or multiple arch expansion joints constructed of abrasion resistant rubber reinforced with high tensile strength synthetic fabric and steel rings.

B. Ends of the expansion joint shall be integral with the body and shall be full faced and drilled per ANSI B16.1 for 125-pound flanges. Beveled and split, galvanized steel retaining rings shall be provided to prevent damage to flanges and to distribute bolting stresses during assembly.

C. Tube, body, and flanges shall be constructed using Buna-N for wastewater, natural rubber for clean water, and Buna-N or neoprene for air. For working temperatures in excess of 180°F or for chemical service, tube, body, and flanges shall be constructed of Viton. The exterior of the expansion joint shall be coated with Hypalon to resist weathering.

D. When used to convey slurries, raw water, or untreated wastewater in horizontal piping, arches shall be filled with a special soft rubber compound integrally cured in the arches.

E. In unrestrained piping systems or pipe systems subject to excessive longitudinal deflection, joints shall be furnished with two plated steel control rods filled with nuts to limit compression and extension and prevent damage to the joint.

F. Rubber expansion joints shall be "Redflex," as manufactured by Red Valve Company, "Invincible Expansion Joint," as manufactured by Mercer Rubber Company, or equal, subject to the requirements of this section.

2.5 SLIP-ON RUBBER EXPANSION JOINTS

Slip-on rubber expansion joints for low pressure applications (less than 15 PSIG) up through 6-inch-diameter in size shall be sleeve-type, single-arch expansion joints constructed of abrasion resistant rubber reinforced with high tensile strength synthetic fabric.

A. Ends of the joint shall be designed to slip over pipe ends and shall be secured in place with adjustable stainless steel clamps. Two clamps shall be provided on each end of the joint.

B. Joint shall be constructed of Buna-N for wastewater and Buna-N or neoprene for air at working temperatures up to 180°F.

2.6 SHOP COATINGS

A. Couplings and adaptors shall have finish as follows:

Material	Location	Primer	Finish
Cast Iron	Buried or Submerged	Asphaltic Varnish Inside and Out	
Cast Iron	Exposed	Asphaltic Varnish (Interior)	
Cast Iron	Exposed	Primer (Exterior)	(Field Applied)
Steel	Buried or Submerged	Epoxy Primer Inside and Out	Coal Tar Epoxy
Steel	Exposed	Primer (Exterior)	(Field Applied)
Steel	Exposed	Epoxy Primer (Interior)	Coal Tar Epoxy (Interior)

B. Coatings used for couplings and adaptors in potable water shall be approved for use with potable water.

2.7 SPARE PARTS

The Contractor shall furnish two spare gasket sets and two spare track head bolt sets for each size and type of coupling.

PART 3 EXECUTION

3.1 INSTALLATION

A. Pipe couplings and expansion joints shall be installed where shown on the Drawings, required, or directed by the Engineer. Couplings and joints shall be installed in strict conformance with the manufacturer's instructions.

B. Pipe ends shall be cleaned, brushed, or filed to produce a mating surface for the gasket that is free from dirt, rust, chuck marks, mill scores, dents, burrs or other foreign substances that would impede proper gasket seating.

C. Grooves for grooved couplings shall be accurately located and cut with a suitable grooving tool.

D. A lubricant recommended by the coupling manufacturer shall be used in seating all gaskets.

E. On expansion couplings and flanged adaptors, bolts shall be tightened diametrically opposite each other and in progression so that the inner rims project an equal distance over the flares of the middle ring at all points. Bolts shall be tightened sufficiently to ensure a watertight joint but shall not be tightened beyond the point of stretching.

F. On grooved couplings, bolts shall be tightened alternately and uniformly so the housing clamps come together evenly and the gasket is not pinched. Bolts shall be tightened until the housing clamps meet.

G. Following installation and testing, couplings shall be field painted in accordance with the requirements of these Specifications. Rubber expansion joints shall not be painted.

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SPECIFICATION 15100

SERVICE LATERAL KIT WITH STAINLESS STEEL VALVES AND THERMOPLASTIC COMPRESSION FITTINGS

1.0 GENERAL

1.01 GENERAL DESCRIPTION: The Contractor shall furnish service lateral kits (exclusive of piping), each consisting of three (3) compression fittings, one (1) combination curb stop/check valve assembly and one (1) curb box. The curb stop/check valve assembly shall be 316 stainless steel and have a two-piece cast 316 stainless steel housing, creating a unilateral body. All plastic compression fittings are to be molded from polypropylene and shall be tested for resistance to aging, pressure rating, tensile strength, and flexural strength. All components shall incorporate compression fitting connections for easy, reliable installation of piping. The lateral kit shall be rated for 150 psi service. Lateral kits with pressure-tested combination curb stop/check valve assembly shall be provided by Environment One Corporation, Niskayuna, New York, or approved equal. One lateral kit shall be installed in the pipe lateral outside the home between the pump discharge and the street main on all installations.

1.02 SHOP DRAWINGS: After receipt of notice to proceed, the Contractor shall furnish an electronic set of shop drawings that details the equipment to be furnished, including dimensional data and materials of construction. The Owner's Engineer shall promptly review this data and return one electronic copy as accepted, or with requested modifications. Upon receipt of accepted shop drawings, the Contractor shall proceed immediately with procurement of the equipment.

1.03 WARRANTY: All merchandise is warranted to be free from defects in materials and factory workmanship. The lateral kit manufacturer shall provide, free of charge, new products in equal quantities for any that prove defective within two (2) years from date of shipment from the factory.

2.0 PRODUCT

2.01 THERMOPLASTIC FITTINGS: All plastic fitting components are to be in compliance with applicable ASTM standards.

All pipe connections shall be made using compression fitting connections including a Buna-N O-ring for sealing to the outside diameter of the pipe. A split-collet locking device shall be integrated into all pipe connection fittings to securely restrain the pipe from hydraulic pressure and external loading caused by shifting and settling.

2.02 TYPE 316 STAINLESS STEEL UNI-LATERAL CURB STOP/CHECK VALVE ASSEMBLY: The lateral kit shall be pressure-tight in both directions. The ball valve actuator shall include position stop features at the fully opened and closed positions.

The curb stop/check valve assembly shall be designed to withstand a working pressure of 235 psi.

The stainless-steel check valve shall be integral with the curb stop valve. The check valve will provide a full-ported 1-1/4” passageway and shall introduce minimal friction loss at maximum rated flow. The flapper hinge design shall provide a maximum degree of freedom and ensure seating at low back pressure.

2.03 CURB BOXES: Curb boxes shall be constructed of ABS, conforming to ASTM-D 1788 and shall be H-20 traffic rated. Lid top casting shall be cast iron, conforming to ASTM A-48 Class 25, providing magnetic detectability, and be painted black. The lid shall have the word “sewer” cast into it. All components shall be inherently corrosion-resistant to ensure durability in the ground. Curb boxes shall provide height adjustment downward (shorter) from their nominal height.

2.04 HIGH DENSITY POLYETHYLENE PIPE: Pipe shall be have a working pressure of 160 psi minimum and shall be classified SDR per ASTM D 3035.

2.05 DEVIATIONS: If a supplier chooses to submit a bid that does not meet all the requirements of this specification, the bid shall include a written description of the deviation with data that shows the magnitude of the deviation and the justification for the deviation from this specification. The decision to accept material deviating from this specification shall be the responsibility of the Owner’s Engineer.

2.06 CERTIFICATION: The owner or the Owner’s Engineer may request certified lab data to verify the physical properties of the pipe materials supplied under this specification or may take random samples and have them tested by an independent laboratory.

2.07 REJECTION: Polyethylene pipe may be rejected for failure to meet any of the requirements of this specification.

2.08 PIPE DIMENSIONS: The SDR (Standard Dimension Ratio) of the pipe supplied shall be as specified by the Owner’s Engineer and shall be SDR 9.

3.0 EXECUTION

3.01 FACTORY TEST: The lateral kit shall be 100 percent hydrostatically tested to 150 psi in the factory.

3.02 CONSTRUCTION PRACTICES: Pipe shall be stored on clean, level ground to prevent undue scratching or gouging of the pipe. If the pipe must be stacked for storage, such stacking should be in accordance with the pipe manufacturer’s recommendations. The pipe should be handled in such a manner that it is not damaged by being dragged over sharp objects or cut by chokers or lifting equipment.

Segments of pipe having cuts or gouges in excess of 10 percent of the wall thickness of the pipe shall be cut out and removed. The undamaged portions of the pipe shall be rejoined using the butt fusion joining method. Sections of polyethylene pipe should be joined into continuous lengths 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 procedure shall be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, fusion temperature, alignment, and fusion pressure.

Fused segments of pipe shall be handled so as to avoid damage to the pipe. When lifting fused sections of pipe, chains or cable-type chokers should be avoided. Nylon slings are preferred. Spreader bars should be used when lifting long, fused sections. Care should be exercised to avoid cutting or gouging the pipe.

3.03 INSTALLATION: Assemble the compression fittings according to the fitting manufacturer's recommendations.

The trench and trench bottom shall be constructed in accordance with ASTM D 2321. Embedment materials should be Class I, Class II or Class III materials as defined in ASTM D 2321. The use of Class IV and/or Class V materials for embedment is not allowed. Bedding of the pipe shall be performed in accordance with ASTM D 2321. Compaction shall be as specified in ASTM D 2321.

Haunching and initial backfill shall be as specified in ASTM D 2321 using Class I, Class II or Class III materials. Materials used and compaction shall be as approved by the Owner's Engineer. ASTM D 2321 sections titled "Minimum Cover for Load Application," "Use of Compaction Equipment" and "Removal of Trench Protection" shall apply unless directed otherwise by the Owner's Engineer.

END OF SECTION

SECTION 15105

HDPE PIPE

PART 1: GENERAL

1-1 DESCRIPTION: The work in this section consists of providing High Density Polyethylene (HDPE) pipe and fittings.

1-2 RELATED WORK SPECIFIED ELSEWHERE: Earthwork – Section 02200.
Pipework General Provisions- Section 15001.

1-3 QUALITY ASSURANCE: References, American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), Federal Specifications (FS), International Standards Organization (ISO), and manufacturer's printed recommendations.

1-4 SUBMITTALS: Material list naming each product to be used identified by manufacturer and type number, in accordance with the Contract Documents and Specifications.

1-5 PRODUCT HANDLING: Handle pipe and fittings to insure delivery in a sound undamaged condition.

1-6 JOB CONDITIONS: Do not lay pipe when trenches or weather conditions are not suitable for such work.

PART 2: MATERIALS

2-1 PIPE:

A. Pipe shall be manufactured from a PE 3408 resin listed with the Plastic Pipe Institute (PPI) as TR-4. The resin material will meet the specifications of ASTM D3350-99 with a cell classification of PE:345464C. Pipe shall have a manufacturing standard of ASTM F714. Pipe shall be DR 17 (100psi WPR) unless otherwise specified on the plans. The pipe shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specification from the same raw material.

2-2 FITTINGS:

A. Butt Fusion Fittings - Fittings shall be PE3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350-99. Butt Fusion Fittings shall have a manufacturing standard of ASTM D3261. Molded & fabricated fittings shall have the same pressure rating as the pipe unless otherwise specified on the plans. Fabricated fittings are to be manufactured using a Data Logger. Temperature, fusion pressure and a graphic representation of the fusion cycle shall be part of the quality control records.

B. Electrofusion Fittings - Fittings shall be PE3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350-99. Electrofusion Fittings shall have a manufacturing standard of ASTM F-1055. Fittings shall have the same pressure rating as the pipe unless otherwise specified on the plans.

C. Flanged and Mechanical Joint Adapters - Flanged and Mechanical Joint Adapters shall be PE 3408 HDPE, Cell Classification of 345464C as determined by ASTM D-3350. Flanged and Mechanical Joint Adapters shall have a manufacturing standard of ASTM D-3261. Fittings shall have the same pressure rating as the pipe unless otherwise specified on the plans.

PART 3: EXECUTION

3-1 GENERAL:

A. Pipe and Fittings: Size as indicated on the plans. Install as shown in accordance with manufacturer's recommendations.

3-2 HAULING, UNLOADING and DISTRIBUTING PIPE: During loading, transportation and unloading, every precaution shall be taken to prevent injury to the pipe. No pipe shall be dropped from cars or trucks, or allowed to roll down slides without proper retaining ropes. During transportation each pipe shall rest on suitable pads, strips, skids or blocks securely wedged or tied in place. Any pipe damaged shall be replaced.

3-3 EARTHWORK: Section 02200.

3-4 FUSION:

A. Sections of polyethylene pipe should be joined into continuous lengths on the jobsite above ground. The joining method shall be the butt fusion method or electro-fusion and shall be performed in strict accordance with the pipe manufacturer's recommendations. The fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements of 400

degrees Fahrenheit, alignment, and an interfacial fusion pressure of 75 PSI. The fusion joining will produce a joint weld strength equal to or greater than the tensile strength of the pipe itself. All field welds shall be made with fusion equipment equipped with a data logger. Temperature, fusion pressure and a graphic representation of the fusion cycle shall be part of the Quality Control records for butt fusion. Quality Control for electro-fusion shall follow manufacturer's recommendations.

B. Mechanical joining will be used where the butt fusion or electro-fusion methods cannot be used. Mechanical joining will be accomplished by either using a HDPE flange adapter with a Ductile Iron back-up ring or HDPE Mechanical Joint adapter with a Ductile Iron back-up ring.

C. Socket fusion, hot gas fusion, threading, solvents, and epoxies will not be used to join HDPE pipe.

3-5 INSPECTION: Inspect the pipe for defects before installation and fusion. Defective, damaged or unsound pipe will be rejected.

3-6 TESTING: Hydrostatic testing shall be in accordance with Section 15001.

PART 4: MEASUREMENT AND PAYMENT

4-1 HDPE PIPE, FITTINGS AND ACCESSORIES: Payment will be included under the bid item to which the work relates.

END