TECHNICAL SPECIAL PROVISIONS

FOR

WATER AND WASTEWATER PIPING

REPLACEMENT AND OUT OF SERVICE REMOVAL

FINANCIAL PROJECT ID: 417540-5-52-01

Date:	**December 16, 2025**
Fla. License No.:	**65011**
Firm Name:	**Weston & Sampson Engineering Inc.**
Firm Address:	**4210 Metro Parkway #230**
City, State, Zip Code:	**Fort Myers, FL 33913**
Pages:	**130**

This item has been digitally signed and sealed by Gary C. Ferrante, PE on the date adjacent to the seal. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

SECTION 01 31 19.23 – 01311

CONSTRUCTION MEETINGS

PART 1 - GENERAL

1.01 PERFORMANCE

A. Section generally defines CONTRACTOR's responsibilities, unless otherwise indicated, for the following:

1. Coordination.

2. Field engineering.

3. Cutting and patching.

4. Preconstruction conference.

5. Progress meetings.

1.02 COORDINATION

A. Immokalee Water and Sewer District (IWSD) has contracted to construct the utility expansion within the community of Immokalee located in Collier County.

The work of this contract will be performed for Immokalee Water and Sewer District (IWSD) and must be coordinated with the Immokalee Water and Sewer District (IWSD) Utilities Standards Manual as applicable.

Other roadway construction work and other utility relocation / installation work may be under construction concurrent with the work of this contract. The CONTRACTOR shall coordinate with the work of other contractors.

1. The CONTRACTOR must comply with all local ordinances, which may affect construction activities. All associated work activities shall take place within public right-of-way.

2. Equivalent sound levels shall not exceed 50 dBA for any construction activities between 9:00 p.m. and 8:00 a.m. on weekdays and Saturdays (non-holidays). Equivalent sound levels shall not exceed 50 dBA for any construction activities on Sundays and legal holidays.

3. The CONTRACTOR shall not drive piling or sheet piling within one mile of any school on FCAT testing days. The CONTRACTOR shall coordinate with Collier County School Board for specific dates of this testing.

B. Coordinate scheduling, submittals, and work to assure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items that shall be installed later.

C. Coordinate completion and clean up of Work of separate sections in preparation for Substantial Completion.

D. Coordinate shut down of any Lift Station, Force Main, Water Main or Re-pump Station and any tie-ins to existing piping with IWSD. Obtain written authorization prior to shutting down any IWSD facility or performing tie-ins.

E. Procure approval from IWSD prior to operating any existing valve.

1.03 FIELD ENGINEERING

A. Employ a Land Surveyor registered in the State of Florida and acceptable to the ENGINEER to perform all field surveys.

B. CONTRACTOR shall locate and protect survey control and reference points.

C. Control datum for survey is based on North American Datum. This information has been provided for CONTRACTOR benefit. Neither IWSD nor their ENGINEERS attest to the accuracy of this information. CONTRACTOR shall determine accuracy at no additional cost to IWSD.

Horizontal Control – All coordinates and bearings are relative to North American Datum (N.A.D.) 1983.

Vertical Control – All elevations are relative to North American Vertical Datum (N.A.V.D.) 1988.

D. Provide field engineering services. Utilize land surveyor to establish elevations, lines, and levels, utilizing recognized survey practices.

E. Submit signed and sealed certification prepared by the Land Surveyor that the elevations and locations of the Work are in conformance with the Contract Documents.

1.04 CUTTING AND PATCHING

A. Employ skilled and experienced installer to perform cutting and patching.

B. Submit written request in advance of cutting or altering elements, which affects:

1. Structural integrity of element.

2. Integrity of weather-exposed or moisture-resistant elements.

3. Efficiency, maintenance, or safety of element.

4. Visual qualities of sight-exposed elements.

5. Work of OWNER or separate CONTRACTOR.

C. Execute cutting, fitting, and patching including excavation and fill, to complete Work, and to:

1. Fit the several parts of the Work together, to integrate with other Work.

2. Uncover Work for installation of subsequent Work or to correct ill-timed Work.

3. Remove and replace defective and non-conforming Work.

4. Remove samples of installed Work for testing.

5. Provide openings in elements of Work for penetrations by mechanical and electrical Work.

D. Execute work by methods, which will avoid damage to other Work, and provide proper surfaces to receive patching and finishing.

E. Cut rigid materials using masonry saw or core drill, as required.

F. Restore Work with new Products in accordance with requirements of Contract Documents.

G. Construct a tight fit between the Work and pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

H. Maintain integrity of wall, ceiling, or floor construction; completely seal any voids, with approved method.

I. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.

J. Identify any hazardous substance or condition exposed during the Work to the ENGINEER.

1.05 PRECONSTRUCTION CONFERENCE

A. ENGINEER will schedule a conference after Notice of Award.

B. Attendance Required: OWNER, ENGINEER, and CONTRACTOR.

C. OWNERs of all utilities within the project area shall be notified.

D. Agenda:

1. Designation of personnel representing the parties in Contract, and the ENGINEER.

2. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders and Contract closeout procedures.

3. Scheduling.

1.06 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work at maximum monthly intervals.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings, record minutes, and distribute copies within two days to ENGINEER, OWNER, participants, and those affected by decisions made at the meeting.

C. Attendance Required: Job superintendent, major Subcontractors and suppliers, OWNER, ENGINEER, as appropriate to agenda topics for each meeting.

D. Agenda:

1. Review minutes of previous meetings.
2. Review of Work progress.
3. Field observations, problems, and decisions.
4. Identification of problems which impede planned progress.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 011000

SUMMARY OF WORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Description of Work

B. CONTRACTOR's Use of Site

C. Work Sequence

D. COUNTY Occupancy

1.2 DESCRIPTION OF WORK

A. General: The Work to be done under this Contract is shown on the drawings and specified in Contract Documents.

B. The Work includes:

1. Furnishing of all labor, material, superintendence, plant, power, light, heat, fuel, water, tools, appliances, equipment, supplies, services and other means of construction necessary or proper for performing and completing the Work.

2. Sole responsibility for adequacy of plant and equipment.

3. Maintaining the Work area and site in a clean and acceptable manner.

4. Maintaining existing facilities in service at all times.

5. Protection of finished and unfinished Work.

6. Repair and restoration of Work or existing facilities damaged during construction.

7. Furnishing as necessary proper equipment and machinery, of a sufficient capacity, to facilitate the Work and to handle all emergencies normally encountered in Work of this character.

8. Furnishing, installing, and protecting all necessary guides, track rails, bearing plates, anchor and attachment bolts, and all other appurtenances needed for the installation of the devices included in the equipment specified. Make anchor bolts of appropriate size, strength and material for the purpose intended. Furnish substantial templates and shop drawings for installation.

C. Implied and Normally Required Work: It is the intent of these Specifications to provide the COUNTY with complete operable systems, subsystems and other items of Work. Any part or item of Work, which is reasonably implied or normally required to make each installation satisfactorily and completely operable, is deemed to be included in the Work and the Contract Amount. All miscellaneous appurtenances and other items of Work incidental to meeting the intent of these Specifications are included in the Work and the Contract Amount even though these appurtenances may not be specifically called for in these Specifications.

D. Quality of Work: Regard the apparent silence of the Contract Documents as to any detail, or the apparent omission from them of a detailed description concerning any Work to be done and materials to be furnished as meaning that only the best general practice is to prevail and that only materials and workmanship of the best quality are to be used. Interpretation of these specifications will be made upon this basis.

1.3 CONTRACTOR'S USE OF SITE

A. In addition to the requirements of the Supplemental Terms and Conditions, limit use of site and premises for work and storage to allow for the following:

1. Coordination of the Work under this CONTRACT with the work of the other contractors where Work under this CONTRACT encroaches on the Work of other contractors.

2. COUNTY occupancy and access to operate existing facilities.

3. Coordination of site use with ENGINEER.

4. Responsibility for protection and safekeeping of products under this CONTRACT.

5. Providing additional off site storage at no additional cost to the COUNTY as needed.

1.4 WORK SEQUENCE

A. Construct Work in stages to accommodate the COUNTY’s use of premises during construction period and in accordance with the limitations on the sequence of construction specified. Coordinate construction schedules and operations with ENGINEER.

B. Coordinate Work of all subcontractors.

1.5 COUNTY OCCUPANCY

A. The COUNTY will occupy premises during entire period of construction in order to maintain normal operations. Cooperate with the COUNTY's Manager or designee in all construction operations to minimize conflict, and to facilitate COUNTY usage.

B. Conduct operations with the least inconvenience to the general public.

1.6 PROTECTION OF EXISTING UTILITIES

A. In case of damage to existing utilities caused by construction activities, contact the owner of the utility or appropriate COUNTY department (Water or Wastewater) immediately. Repair any damage to existing utilities caused by construction activities in coordination with or as directed by the owner of the utility.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

A. Starting Work: Start Work within 10 days following the date stated in the Notice to Proceed and execute with such progress as may be required to prevent delay to other contractors or to the general completion of the project. Execute Work at such items and in or on such parts of the project, and with such forces, material and equipment, as to complete the Work in the time established by the Contract. At all times, schedule and direct the Work so that it provides an orderly progression to completion within the specified time for completion.

END OF SECTION

SECTION 01 33 23 – 01330

SUBMITTALS

PART 1 - GENERAL

1.01 DESCRIPTION OF REQUIREMENTS

A. The type of submittals controlled by these general requirements includes shop drawings, product data, samples and miscellaneous work-related submittals. The individual submittal requirements are specified in applicable sections for each unit of work.

1. Unless otherwise noted, each item of submittal shall be submitted to the ENGINEER for review prior to construction or installation.

2. ENGINEER's review is for general conformance with the design concept and Contract Documents.

B. The submittal will not be accepted for review unless it contains complete information, complies with the specifications, and has been certified by the CONTRACTOR. Submittals that are not accepted will be returned with attached notations of requirements necessary for acceptance. Resubmit after the material has been amended to comply with the comments.

C. When submitting "or equal" submittals for review, one of the ENGINEER's copies shall contain catalog sheets for the specified items marked, FOR COMPARISON ONLY, as well as sheets for the proposed substitutions, otherwise substitutions will not be considered.

D. Prior to prosecution of the work, the CONTRACTOR shall submit to the ENGINEER a schedule of shop drawings that shall include a list of shop drawings he anticipates submitting and the respective date for submittal.

1.02 DEFINITIONS

A. The work-related submittals of this section, in addition to the definitions of the General Conditions and elsewhere in the Contract Documents, are defined as follows:

1. Shop drawings include custom-prepared data of all forms including drawings, diagrams, performance curves, data sheets, schedules, templates, patterns, reports, calculations, instructions, measurements and similar information not in standard printed form applicable to other projects.

2. Product data includes standard printed information on materials, products and systems not custom-prepared for this project, other than the designation of selections from available choices.

3. Samples include both fabricated and unfabricated physical examples of materials, products and work, both as complete units and as smaller portions of units of work; either for limited visual inspection or (where indicated) for detailed testing and analysis.

4. Mock-ups are a special form of samples which are, because of size, usually constructed on the project site.

B. Miscellaneous submittals related directly to the work (non-administrative) include extended warranties or guarantees, maintenance agreements, project photographs and videography, survey data and reports, physical work records, statements of applicability, quality testing, calculations and certifying reports, copies of industry standards, record drawings, operating and maintenance materials, overrun stock, and similar information, devices and materials applicable to the work.

1.03 GENERAL SUBMITTAL REQUIREMENTS

A. Coordination and Sequencing

Coordinate the preparation and processing of submittals with the performance of the work and in accordance with the schedules prepared and referred to in the paragraph(s) on Schedules and Progress Reports of the General Conditions, so that work will not be delayed by submittals. Coordinate and sequence different categories of submittals for the same work, and for interfacing units of work, so that one will not be delayed for coordination with another. Do not proceed with purchasing, fabrication and delivery of work related to a submittal until submittal procedure has been successfully completed. No extension of time will be allowed because of failure to properly coordinate and sequence submittals.

B. Preparation of Submittals

1. Transmit each submittal with an ENGINEER-accepted form. The transmittal form should use sequential transmittal numbers. Resubmittals should have the original number with an alphabetic suffix.

2. Provide permanent marking on each submittal to identify it by project; date; CONTRACTOR, subcontractor, or supplier; submittal name; pertinent contract Drawing sheet or detail number(s); and specification Section number. Submittals which are received directly from sources other than through the CONTRACTOR's office will be returned without review.

3. Where manufacturer's data sheets, catalog pages or drawings have several items shown or a selection of characteristics is shown in charts and graphs, clearly mark the information indicating exactly what will be supplied.

4. Apply CONTRACTOR's stamp, signed or initialed, certifying that the review, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.

C. Number of Copies Required for Each Submittal

See Paragraph 1.05 D. of this section for the number of copies required for each submittal.

D. Submittal Log

The CONTRACTOR is to maintain an accurate updated submittal log and will bring this log to each scheduled progress meeting with the OWNER and/or ENGINEER. This log should include the following items:

1. Submittal description and number assigned
2. Date to ENGINEER
3. Date returned to CONTRACTOR (from ENGINEER)
4. Status of submittal (Approved/Resubmit/Rejected)
5. Date of resubmittal and return (as applicable)
6. Date material released (for fabrication)
7. Projected date of fabrication
8. Projected date of delivery to site
9. Status of O&M submittal

1.04 SPECIFIC CATEGORY REQUIREMENTS

A. General: Except as otherwise indicated in individual work sections, comply with the general requirements specified for each indicated category of submittal. Provide and process intermediate submittals (where required between initial and final) similar to initial submittals.

B. Construction Progress Schedules

1. Submit initial progress schedule in duplicate within 15 days after date of OWNER/CONTRACTOR Agreement for ENGINEER review.

2. Revise and resubmit as required.

3. Submit revised schedules with each Application for Payment, identifying changes since previous version.

4. Submit a horizontal bar chart with separate line for each major section of the Work or operation, identifying first workday of each week.

5. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.

6. Indicate estimated percentage of completion for each item of Work at each submission.

B. Shop Drawings

Provide newly-prepared information; show dimensions and note which are based on field measure, 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 review markings by the ENGINEER to be used in connection with the work.

C. Product Data

1. Collect the required data into one submittal for each material, product or system; and mark each copy to show which choices and options are applicable to the project. Include manufacturer's standard printed recommendations for application and use, compliance with standards, application of labels and seals, notation of field measurements which have been checked, and special coordination requirements. Maintain one set of product data (for each submittal) at the project site, available for reference by the ENGINEER or others.

2. Installer's Copy: Do not proceed with the installation of materials, products or systems until a copy of the applicable product data is in the possession of the installer.

D. Samples

1. Provide units identical to the final condition of the proposed materials or products for the work. Include "range" samples (not less than three units) where variations occur, and identify each unit of each set. Provide full set of optional samples where ENGINEER's selection is required. Prepare samples to match ENGINEER's sample where so indicated. Include information with each sample to show generic description, source or product name and manufacturer, limitations, and compliance with standards.

2. Samples as submitted for review and confirmation of color, pattern, texture and "kind" by the ENGINEER, who will not "test" them (except as otherwise indicated) for other requirements, which are therefore the exclusive responsibility of the CONTRACTOR.

   a. Submittal: At his option, the CONTRACTOR may provide a preliminary submittal of a single set of samples for the ENGINEER's review and "Action." Otherwise, the initial submittal

is the final submittal unless it is returned with "Action" which requires an additional submittal.

1) Submit three sets of samples in the final submittal; two sets will be returned.

2) Quality Control Set: Maintain one of the returned final sets of samples at the project site, in suitable condition and available for quality control comparisons by the ENGINEER and by others.

b. Reusable Samples: Samples which are intended or permitted to be returned and actually incorporated in the work are so indicated in the individual work sections, but must be in undamaged condition at the time of use.

E. Mock-ups

Where mock-ups and similar descriptions of large samples are indicated in individual work sections of these specifications, it is recognized that these are a special type of sample which cannot be readily "transmitted" as specified for submittal of samples. Therefore, comply with the requirements for "samples" and process a transmittal form for each mock-up to provide a record of the activity.

F. Inspection and Test Reports

Submittal is classified either as "shop drawings" or "product data", depending upon whether the report is uniquely prepared for the project or a standard publication of regular product or workmanship control testing at the point of production (respectively).

G. Guarantees, Operating and Maintenance Instructions

1. Refer to individual sections for specific general requirements on the submittal of warranties, guarantees, product/workmanship bonds, and maintenance agreements which are uniquely prepared and executed for the project. Furnish two executed copies, except furnish five additional (conformed) copies where required, for maintenance manual.

2. The CONTRACTOR shall furnish to the OWNER five sets of brochures containing spare parts data and operating and maintenance instructions on all major equipment furnished for the project, and copies of all manufacturer's guarantees and warranties. This material shall be furnished before the completion of the project and before final payment is made to the CONTRACTOR.

H. Trench Safety Act Compliance Certification

The CONTRACTOR shall complete the Trench Safety Act Certification and submit it in triplicate with appropriate signature and corporate seal.

1.05 ENGINEER'S ACTION

A. The ENGINEER will review each required submittal and return it with the action required marked on it.

B. The mark will be a self-explanatory action stamp, marked and executed to indicate whether required submittal is approved, approved as noted, returned for corrections, or rejected.

C. Where marked returned for corrections, do not proceed with work covered by submittal (purchasing, fabrication, delivery or other activity); revise submittal or prepare a new submittal and resubmit without delay, in accordance with ENGINEER's notations stating reasons for returning submittal; repeat if necessary to obtain a different action marking.

D. Email to the ENGIENEER one (1) electronic copy (PDF format) of manufacturer's product data or shop drawings for each specification section item. The original marked document will be retained by the ENGINEER, scanned PDF copies will be sent to the OWNER and the CONTRACTOR.

1.06 CLOSEOUT SUBMITTALS

A. Record Document Copies: Furnish one set of electronic drawings, one set of reproducible drawings and two sets of plain paper drawings unless noted otherwise in the individual sections of these specifications.

B. Maintenance/Operating Manuals: Furnish five bound copies unless noted otherwise in the individual sections of these specifications. Provide one electronic copy of entire approved O&M upon acceptance of the document. Document (including all back-up) will be scanned and copied to CD for submission to the OWNER.

C. Materials and Tools: Refer to individual work sections for required quantities of spare parts, extra and overrun stock, maintenance tools and devices, keys and similar physical units to be submitted.

1.07 OPERATIONS AND MAINTENANCE MANUAL

A. The CONTRACTOR shall submit complete technical operation and maintenance information for each item of mechanical, electrical and instrumentation equipment in an organized manner. The information from each manufacturer shall be gathered and submitted in the form of a single Technical Manual (multiple volumes if required). It shall be written so that it can be used and understood by the OWNER's operation and maintenance staff. Information, as it pertains to preventative maintenance, shall be submitted with the shop drawings.

B. Upon 50% of project completion, based on the length of contract time awarded, the CONTRACTOR shall begin organization of the information, and shall submit the Technical Manual to the ENGINEER in its entirety no later than 75% of the date of project completion, based on the length of contract time awarded.

C. The Technical Manuals submitted by the CONTRACTOR for inclusion in the O&M manual shall be prepared in accordance with applicable specifications.

D. The CONTRACTOR shall furnish to the ENGINEER information (Technical Manuals) for inclusion in the O&M manual. Each set shall consist of one or more volumes, each of which shall be bound in a standard size, 3-ring, loose-leaf, vinyl plastic hard cover binder suitable for bookshelf storage. Binder ring size shall not exceed 2.5 inches. A table of contents indicating all equipment in the binders shall be prepared.

1.08 SPARE PARTS LIST

A. The CONTRACTOR shall furnish as a part of Shop Drawing submittals to the ENGINEER five (5) identical sets of spare parts and special tools information for all mechanical, electrical, and instrumentation equipment. The spare parts list shall include the current list price of each spare part and special tool. The spare parts and special tools list shall be limited to those spare parts and spare tools which each manufacturer recommends be maintained by the OWNER in inventory at the plant site. Each manufacturer or supplier shall indicate the name, address, and telephone number of its nearest outlet of spare parts and special tools to facilitate the OWNER in ordering. The CONTRACTOR shall cross-reference all spare parts and spare tools lists to the equipment numbers designated in the Contract Documents. The spare parts and spare tools list shall be bound in a standard size, 3-ring, loose-leaf, vinyl plastic hard cover binder suitable for bookshelf storage. Binder ring size shall not exceed 2.5 inches.

B. The CONTRACTOR shall furnish to the OWNER all spare parts and spare tools stated on the spare parts and spare tools list that each manufacturer recommends be maintained by the OWNER in inventory at the plant site. The spare parts and spare tools for all mechanical, electrical and instrumentation equipment shall be furnished by the CONTRACTOR to the OWNER at no additional cost and prior to the OWNER's acceptance of the work.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 016100

MATERIAL AND EQUIPMENT

PART 1- GENERAL

1.01 PERFORMANCE

A. Section generally defines CONTRACTOR's responsibilities, unless otherwise indicated, for the following:

1. Products.
2. Transportation and handling.
3. Storage and protection.
4. Product options.
5. Substitutions.

1.02 RELATED SECTIONS

A. Information for Bidders: Product options and substitution procedures.

B. Section 01451 - Quality Control: Product quality monitoring.

1.03 PRODUCTS

A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components required for reuse.

B. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.

1.04 TRANSPORTATION AND HANDLING

A. Transport and handle Products in accordance with manufacturer's instructions.

B. Promptly inspect shipments to assure that Products comply with requirements, quantities are correct, and Products are undamaged.

C. Provide equipment and personnel to handle Products by methods that prevent soiling, disfigurement, or damage.

1.05 STORAGE AND PROTECTION

A. Store and protect Products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive Products in weather-tight, climate controlled enclosures.

B. For exterior storage of fabricated Products, place on secure supports, above ground.

C. Provide off-site storage and protection when site does not permit on-site storage or protection. On-site storage of products must be approved by the OWNER prior to delivery.

D. Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.

E. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

F. Arrange storage of Products to permit access for inspection. Periodically inspect to assure Products are undamaged and are maintained under specified conditions.

1.06 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any Product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

1.07 SUBSTITUTIONS

A. Information for Bidders specify time restrictions for submitting requests for Substitutions during the bidding period to requirements specified in this Section.

B. Substitutions may be considered when a Product becomes unavailable through no fault of the CONTRACTOR.

C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

D. A request constitutes a representation that the Bidder:

1. Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.

2. Will provide the same warranty for the Substitution as for the specified Product.

3. Will coordinate installation and make changes to other Work, which may be required for the Work to be complete with no additional cost to OWNER.

4. Waives claims for additional costs or time extension, which may subsequently become apparent.

5. Will reimburse OWNER for review or redesign services associated with re-approval by the ENGINEER or governing authorities.

E. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals without separate written request, or when acceptance will require revision to the Contract Documents.

F. Substitution Submittal Procedure:

1. Submit three copies of request for Substitution for consideration. Limit each request to one proposed Substitution.

2. Submit shop drawings, Product data, and certified test results attesting to the proposed Product equivalence.

3. The ENGINEER will notify CONTRACTOR, in writing, of decision to accept or reject request.

1.08 EQUIPMENT START-UP

A. CONTRACTOR is responsible for providing start-up services for equipment, where applicable.

1.09 SPECIAL TOOLS

A. Manufacturers of equipment and machinery shall furnish any special tools (including grease guns or other lubricating devices) required for normal adjustment, operations and maintenance, together with instructions for their use. The CONTRACTOR shall preserve and deliver to the OWNER these tools and instructions in good order no later than completion of the Contract.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not used

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 017300

MISCELLANEOUS WORK AND CLEANUP

PART 1 GENERAL

1.1 SCOPE OF WORK

A. This Section includes operations that cannot be specified in detail as separate items but can be sufficiently described as to the kind and extent of work involved. Furnish all labor, materials, equipment and incidentals to complete the work under this Section.

B. The work of this Section includes, but is not limited to, the following:

1. Restoring of sidewalks, driveways, curbing and gutters.

2. Crossing utilities.

3. Relocation of existing water lines, low pressure, gas lines, telephone lines, electric lines, cable TV lines and storm drains as necessary, all as shown on the drawings.

4. Restoring easements and rights-of-ways.

5. Cleaning up.

6. Incidental work.

1.2 WORK SPECIFIED UNDER OTHER SECTIONS

A. Complete all work in a workmanlike manner by competent workmen in full compliance with all applicable sections of these Specifications.

PART 2 PRODUCTS

2.1 MATERIALS

A. Materials required for this Section shall be of at least the same type and quality as materials that are to be restored. Where possible, reuse existing materials that are removed and then replaced, with the exception of paving.

PART 3 EXECUTION

3.1 RESTORING OF CURBING, FENCES, AND GUARD RAILS

A. Protect existing curbing. If necessary, remove curbing from joint to joint and replace after backfilling. Replace curbing that is damaged during construction with curbing of equal quality and dimension.

3.2 CROSSING UTILITIES

A. This item shall include any extra work required in crossing culverts, water courses, drains, water mains, and other utilities, including all sheeting and bracing, extra excavation and backfill, or any other work required for the crossing, whether or not shown on the drawings.

3.3 RELOCATIONS OR REPLACEMENT OF EXISTING GAS LINES, TELEPHONE LINES, ELECTRIC LINES, CABLE TV LINES AND DRAINAGE CULVERT

A. Notify the proper authority of the utility involved when relocation or replacement of these lines is required. Coordinate all work by the utility so that the progress of construction will not be hampered.

B. Reference all side drains, side ditches, swales, and storm sewers as to grade and location prior to construction, maintain them during construction, and repair them as necessary after construction. Where drainage structures are disturbed and must be replaced, the minimum size replacement shall be twelve inches (12"). All drainage culverts installed shall have mitered ends in conformance with the Collier County Standard Details. Place the culvert to the specified elevations and regrade or reshape the swale and road shoulders that have been disturbed or damaged during construction.

3.4 PROTECTION AND RESTORATION OF PROPERTY

A. Protection and Restoration of Property: During the course of construction, take special care and provide adequate protection in order to minimize damage to vegetation, surfaced areas, and structures within the construction right-of-way, easement or site, and take full responsibility for the replacement or repair thereof. Immediately repair any damage to private property created by encroachment thereon. Should the removal or trimming of valuable trees, shrubs, or grass be required to facilitate the installation within the designated construction area, this work shall be done in cooperation with the County and/or local communities which the work takes place. Said valuable vegetation, removed or damaged, shall be replanted, if possible, or replaced by items of equal quality, and maintained until growth is re-established. Topsoil damaged in the course of work shall be replaced in kind with suitable material, graded to match existing grade. Following construction completion, the work area along the route of the installation shall be finish grade to elevations compatible with the adjacent surface, with grassing or hand raking required within developed areas.

B. Existing lawn surfaces damaged by construction shall be re-graded and re-sodded or re-seeded. These areas shall be maintained until all work under this Contract has been completed and accepted.

3.5 CLEANING UP

A. Remove all construction material, excess excavation, buildings, equipment and other debris remaining on the job as a result of construction operations and shall render the site of the work in a neat and orderly condition.

B. Work site clean-up shall follow construction operations without delay and in accordance with Section 017423.

3.6 INCIDENTAL WORK

A. Do all incidental work not otherwise specified, but obviously necessary for the proper completion of the Contract as specified and as shown on the drawings.

END OF SECTION

SECTION 017413

CLEANING

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. General Requirements

B. Disposal Requirements

1.2 GENERAL REQUIREMENTS

A. Execute cleaning during progress of the work and at completion of the work.

1.3 DISPOSAL REQUIREMENTS

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

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 DURING CONSTRUCTION

A. Execute daily cleaning to keep the work, the site, and adjacent properties free from accumulations of waste materials, rubbish, and windblown debris, resulting from construction operations.

B. Provide onsite containers for the collection of waste materials, debris and rubbish. All waste materials including containers, food debris and other miscellaneous materials must be disposed of daily in onsite containers.

C. Remove waste materials, debris and rubbish from the site periodically and dispose of at legal disposal areas away from the site.

3.2 FINAL CLEANING

A. Requirements: At the completion of work and immediately prior to final inspection, clean the entire project as follows:

1. Thoroughly clean, sweep, wash, and polish all work and equipment provided under the Contract, including finishes. Leave the structures and site in a complete and finished condition to the satisfaction of the ENGINEER.

2. Direct all subcontractors to similarly perform, at the same time, an equivalent thorough cleaning of all work and equipment provided under their contracts.

3. Remove all temporary structures and all debris, including dirt, sand, gravel, rubbish and waste material.

4. Should the CONTRACTOR not remove rubbish or debris or not clean the buildings and site as specified above, the OWNER reserves the right to have the cleaning done at the expense of the CONTRACTOR.

B. Employ experienced workers, or professional cleaners, for final cleaning.

C. Use only cleaning materials recommended by manufacturer of surface to be cleaned.

D. In preparation for substantial completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.

E. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from sight-exposed interior and exterior finished surfaces. Polish surfaces so designated to shine finish.

F. Repair, patch, and touch up marred surfaces to specified finish, to match adjacent surfaces.

G. Replace air-handling filters if units were operated during construction.

H. Clean ducts, blowers, and coils, if air-handling units were operated without filters during construction.

I. Vacuum clean all interior spaces, including inside cabinets.

J. Handle materials in a controlled manner with as few handlings as possible. Do not drop or throw materials from heights.

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

L. Clean interior of all panel cabinets, pull boxes, and other equipment enclosures.

M. Wash and wipe clean all lighting fixtures, lamps, and other electrical equipment that may have become soiled during installation.

N. Perform touch-up painting.

O. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds.

P. Remove erection plant, tools, temporary structures and other materials.

Q. Remove and dispose of all water, dirt, rubbish or any other foreign substances.

3.3 FINAL INSPECTION

A. After cleaning is complete the final inspection may be scheduled. The inspection will be done with the OWNER and ENGINEER.

END OF SECTION

SECTION 01 78 00 – 01770

PROJECT CLOSEOUT

PART 1- GENERAL

1.01 PERFORMANCE

A. Section generally defines CONTRACTOR's responsibilities, unless otherwise indicated, for the following:

1. Closeout Procedures.
2. Final Cleaning.
3. Adjusting.
4. Warranties.

1.02 RELATED SECTIONS

A. Section 01500 - Construction Facilities and Temporary Controls.

1.03 CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for ENGINEER's inspection.

B. Provide submittals to ENGINEER that are required by governing or other authorities.

C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

D. Submit final as-builts (two sets signed and sealed by the Surveyor and one electronic copy each in DWG and PDF formats).

1.04 FINAL CLEANING

A. Execute final cleaning prior to final inspection by OWNER and ENGINEER.

B. Clean interior and exterior surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces.

C. Clean equipment and fixtures to a sanitary condition.

D. Clean site; rake clean landscaped surfaces.

E. Remove waste and surplus materials, rubbish, and construction facilities from the site.

1.05 ADJUSTING

A. Adjust operating Products and equipment to ensure smooth and unhindered

operation.

1.06 WARRANTIES

A. Provide duplicate notarized copies.

B. Execute and assemble documents from Subcontractors, suppliers, and manufacturers.

C. Provide Table of Contents and assemble in binder with durable plastic cover.

D. Submit prior to final Application for Payment.

E. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

F. Provide operation and maintenance documentation.

PART 2 - PRODUCTS

Not used

PART 3 - EXECUTION

Not used

END OF SECTION

SECTION 01 78 39 – 01765

PROJECT AS-BUILT RECORD DRAWINGS

PART 1 - GENERAL

1.01 PERFORMANCE

A. Section generally defines CONTRACTOR's responsibilities, unless otherwise indicated, for the following.

1. On site maintenance of Record Documents.

2. Required record information.

1.02 MAINTENANCE

A. Maintain on site, one set of the following Record Documents; record actual revisions to the Work:

1. Drawings.

2. Specifications.

3. Addenda.

4. Change Orders and other modifications to the Contract.

5. Shop Drawings, product data, and samples.

B. Store Record Documents separate from documents used for construction.

C. Record information concurrent with construction progress.

D. In the interest of timely detection of non-conforming Work, all Record Drawing information for the partially completed work must be furnished to the ENGINEER prior to submitting for periodic progress payments on the partially completed Work.

E. Under no circumstances will pavement restoration Work be allowed to start until the ENGINEER has reviewed the Record Drawing information for Work constructed within the area that pavement will be restored.

F. All Record Drawing information must be obtained by a Professional Land Surveyor, who is licensed in the State of Florida. Information must be signed and sealed.

G. Record Documents must be available to ENGINEER for examination at any time during the progress of the Work.

H. Submit completed Record Documents upon completion of the Work, at each pay request, and prior to application for final payment.

1.03 REQUIRED RECORD DRAWING INFORMATION

A. General

1. Drawings on 11 inch x 17 inch paper media that will reproduce legibly and electronic files in DWG and PDF format.
2. Label drawings “Record Drawings” with date.
3. Complete title block with current file name
4. Location sketch
5. Correct Street/Road names.

C. Pressure Pipe

1. As-built entire facility from existing tie–in to existing tie-in as determined by the OWNER. Extensions of an imaginary line will not be acceptable as reference points.

2. State plane coordinates of each valve, fitting, air release valve, service line, etc. and radial dimensions from a nearby permanent object where possible.

3. Type of materials installed - pipe and appurtenances. Indicate all locations of change of material including joint type (M.J., slip, restrained).

4. Valve type (butterfly, gate, air release).

5. As-built length of all jack and bore casings indicating distance from center line of paving to each end of casing. The as-built invert elevation of each end of casing, and as-built distance from each end of casing to limits of mechanical joint pipe is also required.

6. As-built elevations at tie-in locations and any major changes in direction and/or elevation. Elevations shown at these intervals and changes must show top of pipe elevation and finished grade elevation at that location.

7. As-built elevations of conflict pipes, drainage swales, canals, etc. as required by IWSD and Collier County Health Department (CCHD).

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 SURVEYOR RESPONSIBILITIES

A. ENGINEER will furnish electronic files (DWG format) of all applicable Drawings for surveyor's use in plotting Record Drawing information.

B. Record information is to be inserted into the DWG file. Signed and sealed prints are to be submitted at appropriate stages of construction as designated by the ENGINEER.

C. Mark information on the Drawing in a manner that indicates which elevations and dimensions have been checked. This is to be done by crossing through the design elevation or dimension and placing the Record information next to it. If an elevation or dimension has not changed, the same procedure should be followed to confirm that it has been checked. Add new information in a manner to indicate that it is Record information and not design information.

D. Each Record Drawing sheet must include the surveyor's name, company, address, and registration number.

E. At the conclusion of the Project, provide signed and sealed prints and electronic copies of Record Drawings as indicated in Section 01700.

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 02151

SHORING, SHEETING AND BRACING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Work required for protection of an excavation or structure through shoring, sheeting, and bracing.

B. Related Work Specified In Other Sections Includes:

1. Section 02222 - Excavation - Earth and Rock
2. Section 02223 - Backfilling

1.2 SUBMITTALS

A. General: Provide all submittals, including the following, as specified in Division 1.

B. CONTRACTOR's Submittals: All sheeting and bracing shall be the responsibility of the CONTRACTOR to retain qualified design services for these systems, and to be completed with strict adherence to OSHA Regulations. Submit complete design calculations and working drawings of proposed shoring, sheeting and bracing which have been prepared, signed and sealed by a Licensed Professional Engineer experienced in Structural Engineering and registered in the State of Florida, before starting excavation for jacking pits and structures. Use the soil pressure diagram shown for shoring, sheeting and bracing design. ENGINEER's review of calculations and working drawings will be limited to confirming that the design was prepared by a licensed professional engineer and that the soil pressure diagram shown was used.

1.3 REFERENCES

A. Design: Comply with all Federal and State laws and regulations applying to the design and construction of shoring, sheeting and bracing.

B. N.B.S. Building Science Series 127 "Recommended Technical Provisions for Construction Practice in Shoring and Sloping Trenches and Excavations.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Do work in accordance with the U.S. Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety Act of 1970 (PL 91-596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL 91-54), and the Florida Trench Safety Act. The CONTRACTOR shall also observe 29 CFR 1910.46 OSHA’s regulation for Confined Space Entry.

PART 2 PRODUCTS

2.1 MANUFACTURERS AND MATERIALS

A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted.

B. Material Recommendations: Use manufacturers and materials for shoring, sheeting and bracing as recommended by the Licensed Professional Engineer who designed the shoring, sheeting, and bracing.

1. Wood Materials: Oak, or treated fir or pine for wood lagging.

PART 3 EXECUTION

3.1 SHORING, SHEETING AND BRACING INSTALLATION

A. General: Provide safe working conditions, to prevent shifting of material, to prevent damage to structures or other work, to avoid delay to the work, all in accordance with applicable safety and health regulations. Properly shore, sheet, and brace all excavations which are not cut back to the proper slope and where shown. Meet the general trenching requirements of the applicable safety and health regulations for the minimum shoring, sheeting and bracing for trench excavations.

1. CONTRACTOR's Responsibility: Sole responsibility for the design, methods of installation, and adequacy of the shoring, sheeting and bracing.

B. Arrange shoring, sheeting and bracing so as not to place any strain on portions of completed work until the general construction has proceeded far enough to provide ample strength.

C. If ENGINEER is of the opinion that at any point the shoring, sheeting or bracing are inadequate or unsuited for the purpose, resubmission of design calculations and working drawings for that point may be ordered, taking into consideration the observed field conditions. If the new calculations show the need for additional shoring, sheeting and bracing, it should be installed immediately.

D. Monitoring: Periodically monitor horizontal and vertical deflections of sheeting. Submit these measurements for review.

E. Accurately locate all underground utilities and take the required measures necessary to protect them from damage. All underground utilities shall be kept in service at all times as specified in Division 1.

F. Driven Sheeting: Drive tight sheet piling in that portion of any excavation in paved or surface streets City collector and arterial streets and in State and County highways below the intersection of a one-on-one slope line from the nearest face of the excavation to the edge of the existing pavement or surface.

G. Sheeting Depth: In general drive or place sheeting for pipelines to a depth at elevation equal to the top of the pipe as approved.

1. If it is necessary to drive sheeting below that elevation in order to obtain a dry trench or satisfactory working conditions, cut the sheeting off at the top of the pipe and leave in place sheeting below the top of the pipe.

2. Cut off sheeting not designated as "Sheeting Left in Place". The cut ends of sheeting left adjacent to the pipe will be paid for as "Sheeting Left in Place".

3. Do not cut the sheeting until backfill has been placed and compacted to the top of the pipe.

H. Sheeting Removal: In general, remove sheeting and bracing above the top of the pipe as the excavation is refilled in a manner to avoid the caving in of the bank or disturbance to adjacent areas or structures. Sheeting shall be removed as backfilling progresses so that the sides are always supported or when removal would not endanager the construction of adjacent structures. When required to eliminate excessive trench width or other damages, shoring or bracing shall be left in place and the top cut off at an elevation 2.5 feet below finished grade, unless otherwise directed.

1. Carefully fill voids left by the withdrawal of the sheeting by jetting, ramming or otherwise.

2. No separate payment will be made for filling of such voids.

I. Permission for Removal: Obtain permission before the removal of any shoring, sheeting or bracing. Retain the responsibility for injury to structures or to other property or persons from failure to leave such shoring, sheeting and bracing in place even though permission for removal has been obtained.

J. Preload internal braces to 50 percent of the design loads.

K. Proof test tie backs to 133 percent of the design loads and lock off tie backs at 75 percent of the design loads.

3.2 SHEETING LEFT IN PLACE FOR PROTECTION

A. Ordered Left in Place: In addition to sheeting specified or shown to be left in place, the ENGINEER may order, in writing, any or all other shoring, sheeting or bracing to be left in place for the purpose of preventing injury to the structures, pipelines or to other property or to persons.

1. Cutoff sheeting left in place at the elevation shown or ordered, but, in general, at least 2.5 feet below the final ground surface.

2. Drive up tight any bracing remaining in place.

B. Right to Order: Do not construe the right to order shoring, sheeting and bracing left in place as creating any obligation to issue such orders.

C. Payment: Shoring, sheeting and bracing left in place, by written order, will be paid for under the appropriate Contract Items or where no such items exist, as changes in the work.

END OF SECTION

SECTION 02282

CONNECTIONS TO EXISTING BURIED PIPELINES

PART 1 – GENERAL

1.01 DESCRIPTION

This section includes materials and installation of hot tap connections to buried pipelines.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. SECTION 02085, PVC GRAVITY PIPES AND FITTINGS

B. SECTION 02622, PVC FORCE MAIN PIPE

C. SECTION 02620, HDPE PIPE AND FITTINGS

1.03 SUBMITTALS

A. Submit shop drawings in accordance with the General Conditions and Section 01300.

B. Submit manufacturer's catalog data for tapping sleeves. Show coatings.

PART 2 – MATERIALS

2.01 TAPPING SLEEVES FOR DUCTILE IRON AND PVC (CAST-IRON OUTSIDE DIAMETER) PIPES.

A. Tapping Sleeves shall comply with MSS SP-60, MSS SP-111, AWWA C223 and MSS SP-113.

B. Tapping Sleeve for Ductile-Iron and PVC (Cast-Iron Outside Diameter) Pipes: Mueller H-615 or equivalent.

C. Pressure rating shall be at least 200 psi for piping 12 inches and smaller and at least 150 psi for piping 14 through 24 inches.

2.02 COATING FOR TAPPING SLEEVES

Coat with fusion-bonded epoxy per Section 09971.

2.03 TAPPING GATE VALVES

Provide a ductile-iron resilient wedge gate valve per Section 15100 for the tapping gate valve.

2.04 LINE STOPPING FOR EXISTING WATER OR FORCE MAIN

A. Before beginning line stop installation, coordinate work with the Immokalee Water and Sewer District.

B. The outside and inside diameters of the existing pipeline are required prior to ordering the tapping fitting and line stopper. Using the exposed portion of the pipeline, determine the outside diameter and inside diameter of the existing main. Provide this information to the line stopping equipment manufacturer. Determine the pipe wall thickness by ultrasonic testing.

C. The line stop tapping fitting shall be a full encirclement split tee, Type 304 stainless steel, assembled with either a bolted or the line stop tapping fitting to the existing main with a nonasbestos synthetic rubber gasket. Construct the gasket from the following materials: Buna-N, Teflon, Kevlar aramid fiber or acrylic fiber bound by nitrile. The split tee outlet flange shall be Class 125 per AWWA C115. Bolts and nuts for the flange shall be carbon steel, ASTM A307, Grade B. The Contractor has the option of either using a fully expandable rubber stopper rated to a minimum of 100 psi or carbon steel pivoting head with Buna-N sealing element rated to a minimum of 100 psi as the line stopping head mechanism. The temporary removable valve shall be a resilient wedge gate valve rated at 150 psi. The line stop and accessories shall be HYDRA-STOP, IPSCO or equivalent.

PART 3 – EXECUTION

3.01 VERIFICATION OF PIPE OUTSIDE DIAMETER PRIOR TO INSTALLATION

Excavate the points of connection prior to submittal of shop drawings. Verify outside diameter prior to ordering materials.

3.02 LINE STOPPING PROCEDURE

A. Install concrete and support thrust blocking before installing the Temporary pressure tapping machinery and valve. After tapping and line stopping operations have been completed seal the tee fitting with an ASTTM A36 steel pin-locked completion plug with Buna-N O ring seal. After the completion plug has been installed, close the fitting with a blind flange meeting the requirements of AWWA C110.

B. Any damage that occurs due to the Contractor's work to the line stop fitting, accessories or existing main shall be repaired at the Contractor's expense.

C. Dispose of water or sewage and existing pipe at no additional cost to the Owner. Comply with permit requirements. Any violation of permit requirements shall be the sole responsibility of the Contractor.

D. In order to aid the Contractor in the Construction of the replacement pipe or main, the upstream sewerage lift or water pumping stations may be temporarily shut down by coordinating with the Owner.

END OF SECTION

SECTION 02534

PVC GRAVITY SEWER PIPE

PART 1 - GENERAL

1.01 Description

This section includes materials, installation, and testing of PVC gravity sewer pipe conforming to ASTM D3034 or ASTM F670. Sizes are 4 through 15 inches for ASTM D3034 pipe and 18 through 27 inches for ASTM F679 pipe.

A. Related Work Specified Elsewhere

1. Precast Circular Concrete Manholes: 03461
2. Excavation: 02222
3. Backfilling: 02223
4. Leakage and Infiltration Testing: 02676

B. Submittals

1. Submit shop drawings in accordance with the General Conditions and Section 01300.
2. Submit reports on testing per ASTM D3034 (pipes 4 inches through 15 inches), ASTM F679 (pipes 18 inches through 27 inches), ASTM D3212 and ASTM F477.

PART 2 - MATERIALS

2.01 PVC Material

Additives and fillers, including stabilizers, antioxidants, lubricants, colorants, etc., shall not exceed 10 parts by weight per 100 of PVC resin in the compound.

A. Pipe

1. Pipe 4 through 15 inches shall conform to ASTM D3034, SDR 26.
2. Pipe 16 through 27 inches shall conform to ASTM F679, Pipe Stiffness Class PS-46.

B. Joints

Provide elastomeric gasket joints of the push-on type, conforming to ASTM D3212.

C. Gaskets

Gaskets for push-on joints shall conform to ASTM F477.

D. Fittings

1. Fittings for pipe 4 through 15 inches shall conform to ASTM D3034, SDR 26.

2. Fittings for pipe 16 through 27 inches shall be fabricated of the same material as the pipe and shall comply with ASTM F679.

E. Mandrel for Field Testing of Pipe Deflection

The mandrel shall:

1. Be a rigid, nonadjustable, odd-numbering-leg (nine legs minimum) mandrel having an effective length not less than its nominal diameter.

2. Have a minimum diameter at any point along the full length as follows:

Pipe Material	Nominal Size (inches)	Minimum Mandrel Diameter (inches)
PVC-ASTM D3034 (SDR 26)	6	5.619
	8	7.524
	10	9.405
	12	11.191
	15	13.849
PVC-ASTM F679 (T-1 Wall)	18	16.924
	21	19.952
	24	22.446
	27	25.297

3. Be fabricated of steel; be fitted with pulling rings at each end; be stamped or engraved on some segment other than a runner indicating the pipe material specification, nominal size, and mandrel outside diameter (e.g., PVC, D 3034-8"-7.524"); and be furnished in a carrying case labeled with the same data as stamped or engraved on the mandrel.

4. Costs attributable to mandrel and deflection testing, including any delays, shall be included as part of the unit prices bid.

PART 3 - EXECUTION

3.01 Laboratory Testing

A. Conduct tests required in ASTM D3034 or F789, F679, D3212**,** and F477.

B. The acceptable rates of failure for quality control tests shall be as follows:

1. Outer Diameter: 0%.

2. Minimum Wall Thickness: 0%.

3. Other Dimensions: 0%.

4. Flattening: 0%.

5. Impact: Six of six samples must pass; if one fails, test six more; all six must pass.

3.02 Installing PVC Sewer Pipe

A. Install in accordance with ASTM D2321, and as described below.

B. Pipe shall not deviate more than 1 inch from line or 1/4 inch from grade. Measure for grade at the pipe invert.

C. Minimum bedding thickness shall be as shown on the plan trench details.

D. Lay pipe without break, upgrade from structure to structure, with the socket ends of the pipe upgrade.

E. Do not use the pipe as a drain for removing water that has infiltrated into the trench.

F. After joint assembly, bring the bedding material up to pipe spring line. Bedding material shall be imported sand. Place the bedding material on each side of the pipe. Tamp the bedding material into final position at pipe spring line and continue to the top of the pipe. Relative compaction shall be in conformance with Section 02221.

G. Then place bedding material to 1 foot above the top of the pipe and compact to the same relative compaction as in the pipe zone per Section 02223 The remainder of the trench backfill shall be native material, installed per Section 02223 and the plan details.

H. Do not use hydro-hammers to compact bedding or backfill.

3.03 Installing Laterals

A. Each wye branch fitting shall have its barrel diameter equal to the diameter of the sanitary sewer main and the spur (or branch) diameter as indicated in the drawings. Do not place wye branches within 5 feet of any structure.

B. Install wye fittings so that the outlet branch is inclined upward at an angle of 45 degrees. Plug wye branch fittings that are to be left unconnected with a stopper or plug. Join laterals to wye branch fittings at the sanitary sewer main by eighth bends. Eighth bends and quarter bends are a part of lateral sewer line.

C. End of the lateral shall be at least 3 feet below the existing or proposed grade of the ground at existing structure to be served or as called for in the drawings.

D. Where possible, laterals shall run perpendicular to the sewer main at a minimum grade of 2%. Bed laterals the same as the sewer main into which they connect.

E. Plug laterals with stopper in the socket of the last joint. Seal stopper in place so that it will withstand the internal pressure during the test for leakage and so that it may be removed without damage to the socket.

F. Mark the location of each lateral by chiseling a letter "S" 1 1/2 inches high on the top of the curb. If the terminal point of the lateral is more than 8 feet beyond the curb line or curb improvements do not exist, provide and install a 4-inch by 4-inch by 3-foot 0-inch stake extending 2 inches above the ground and placed at the end of the connection.

3.04 Installing Pipe at Manholes and Structures

A. Place a 2-foot PVC length of pipe of the same inside diameter as the adjoining pipe at the inlet and outlet to each manhole or structure. Use one of the following methods:

1. Directly cast a manhole coupling into the manhole base. Provide rubber-ring gasket in the coupling.

2. Stretch a rubber-ring gasket around the pipe to serve as a water stop when cast into the structure wall.

B. Do not cast pipe bells into manholes or structures. Cut off the bell so that no recess or offset appears on the exposed face from the inside wall of the pipe to the outside wall of the pipe. The pipe shall have a plain end, flush with the inside wall of the manhole or structure, or as shown in the drawings.

3.05 Testing for Defects of Installed Pipe

Following placement and compaction of backfill and prior to placing permanent pavement, ball and mandrel the pipe to measure for obstructions (excessive deflections, joint offsets, and lateral pipe intrusions).

3.06 Field Testing for Pipe Deflection

A. Test installed pipe to ensure that vertical deflections for plastic pipe do not exceed the maximum allowable deflection. Maximum allowable deflections shall be governed by the mandrel requirements stated herein and shall nominally be:

Nominal Pipe Size	Percentage
Up to and including 12 inches	5.0
Over 12 to and including 27 inches	4.0

B. The maximum average inside diameter shall be equal to the average outside diameter per applicable ASTM standard minus two minimum wall thicknesses per applicable ASTM standards. Manufacturing and other tolerances shall not be considered for determining maximum allowable deflections.

C. Perform deflection tests not sooner than 30 days after completion of placement and compaction of backfill. Clean and inspect the pipe for offsets and obstructions prior to testing.

D. Pull a mandrel through the pipe by hand to verify that maximum allowable deflections have not been exceeded. Prior to use, the mandrel shall be certified by an independent testing laboratory. Use of an uncertified mandrel or a mandrel altered or modified after certification will invalidate test. If the mandrel fails to pass, the pipe will be deemed to be overdeflected.

E. Uncover any overdeflected pipe and, if not damaged, reinstall. Remove damaged pipe from the site. Any pipe subjected to any method or process other than removal, which attempts, even successfully, to reduce or cure any overdeflection, shall be uncovered, removed from the site, and replaced with new pipe.

3.07 Leakage Test

See Section 02676.

3.08 Testing for Alignment and Grade

After the pipe has been installed, tested for leakage, backfilled to existing grade, and manholes raised to grade and resurfaced, "ball" the pipe from manhole to manhole with a sewer scrubbing ball. After balling the pipe, perform the following:

I. "Mirror" straight sewers and inlet/outlet ends of curvilinear sewers. Perform balling and mirroring in the presence of the Owner to test for alignment, grade, damaged or defective pipe in place, or any other type of faulty installation. Should balling and mirroring indicate faulty installation of the pipe, perform repairs or replacements to bring the installation into conformance with these specifications.

END OF SECTION

SECTION 02622

POLYVINYL CHLORIDE (PVC) FORCE MAIN PIPE

PART 1 GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals required, and install polyvinyl chloride (PVC) force main pipe, fittings, and appurtenances a shown on the drawings and as specified herein.

1.2 SUBMITTALS

A. Submit to the ENGINEER within fourteen calendar days after receipt of Notice-to-Proceed a list of materials to be furnished, the names of the suppliers and the date of delivery of materials to the site.

B. Submit for approval, as provided in the General Conditions, complete, detailed shop drawings of all PVC pipe and fittings.

C. Submit and shall comply with pipe manufacturer's recommendations for handling, storing, and installing pipe and fittings.

PART 2 PRODUCTS

2.1 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

A. Unless otherwise shown on the Drawings or specified, PVC force main pipe shall meet the following minimum requirements:

1. For PVC pipe not installed under roadway pavement:

   a. Pipe 4 inches through 12 inches in diameter shall be DR18, AWWA C-900.

   b. Pipe 14 inches through 24 inches in diameter shall be DR25, AWWA C905.

2. For PVC pipe installed under roadway pavement by direct burial:

   a. Pipe 4 inches through 12 inches in diameter shall be DR14, AWWA C-900

   b. Pipe 14 inches through 24 inches in diameter shall be DR18, AWWAC905.

   c. Pipe greater than 24 inches in diameter shall be DR25, AWWA C-905.

B. PVC fittings 4 inches and larger in diameter shall meet the requirements of applicable AWWA C900 and C905 specifications. Fittings shall be ductile iron fittings with mechanical or push on joints conforming to AWWA C153 or C110. Ductile iron fittings shall have a fusion bonded epoxy coating to a minimum of 20 mil thickness.

C. Pipe shall be homogeneous throughout. It shall be free from voids, inclusions, and other defects. Pipe surface shall be free from nicks and scratches, joining surfaces of spigots and joints shall be free from gouges and imperfections that could cause leakage.

D. All joints shall be made in accordance with the manufacturer's recommendations. The particular joint used shall be approved by the Immokalee Water and Sewer District prior to installation. No sulfur-based compounds shall be used.

E. Pipe shall be furnished in standard laying lengths not exceeding 20 feet.

F. Restrained joints shall be provided at all tees, plugs, horizontal bends, vertical offsets, and locations shown on the drawings. Joint restraint devices for C-900, C905 PVC pipe used with ductile iron mechanical joint fittings shall be EBAA Iron Inc., Series 2000 PV, Uni-Flange 1300, Star Pipe Product, L.P., or approved equal. Bell joint restraint devices for PVC push joint pipe shall be EBAA Iron Inc., Series 1600 for C- 900 PVC pipe, Series 2800 for bell restraint on C- 905 PVC pipe or Uni-Flange Series 1300, 1360 or 1390 or ROMAC Series 600, Star Pipe Products L.P., or approved equal. Bolts and nuts shall be Ductile Iron or 300 Series Stainless Steel, T-Head type with hexagonal nuts. Bolts and nuts shall be machined through and nuts shall be tapped at right angles to a smooth bearing surface. Restraints shall be Class 150 psi and shall be capable of Withstanding 300 psi quick burst test without separation or failure. Suitable PVC/ductile iron adapters shall be provided as necessary.

G. PVC pipe fittings for 2-inch and smaller diameter pipe shall be glued and shall be Schedule 80 and conform to the requirements of ASTM 0-2464. Threaded joints can be used with PVC Schedule 80 pipe or stronger with diameters larger than 2 inches. At threaded joints between PVC and metal pipes, the metal shall contain a threaded socket end and the PVC threaded spigot end. A metal spigot shall not under any circumstances, be screwed into a PVC socket.

2.2 IDENTIFICATION

A. Pipe shall bear identification markings that will remain legible after normal handling, storage, and installation. Markings shall be applied in a manner that will not weaken or damage the pipe. Marking shall be applied at intervals of not more than 5 feet on the pipe. Marking on the pipe shall include the following:

B Nominal size and 00 base.

C. PVC.

D. Dimension ratio.

E. AWWA pressure rating.

F. AWWA designation.

G. Manufacturer's name or trademark.

H. Manufacturer's production code, including day, month, year, shift, plant, and extruder of manufacture.

I. All PVC sewage force main pipe shall be color coded green.

2.3 STRUCTURE AND MANHOLE CONNECTIONS

A. Pipe stubs for all structure and manhole connections shall not exceed 12 inches in length unless otherwise shown on the drawings. Caps shall be furnished were required.

PART 3 EXECUTION

3.1 INSTALLATION

A. PVC force main pipe shall be installed in accordance with the manufacturer's recommendation, as shown on the Drawings, and as specified herein.

B. Use care in handling, storage, and installation of pipe and fittings. Storage of pipe on the job site shall be done in accordance with the pipe manufacturer's recommendation. Under no circumstances shall pipe or fittings be dropped into the trench.

C. Pipe shall be laid to lines and grade shown on the Drawings with bedding and backfill as shown on the Drawings and as specified in Section 02223. Blocking under the pipe will not be permitted.

D. When laying is not in progress, or the potential exists for dirt or debris to enter the pipe, the open ends of the pipe shall be closed with plug or by other approved means.

E. In all cases where PVC pipe is installed, identification tape shall be located above the top of the pipe as shown on the Drawings.

3.2 TESTING FORCE MAINS

A. Test force mains for leakage in accordance with Section 02670.

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 02650

LAYING AND JOINTING BURIED
PIPELINES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Installation of all underground pipelines. Provide pipeline materials, coatings and linings as specified and pipe of the types, sizes and classes shown or specified.

1. Use proper and suitable tools and appliances for the safe and convenient cutting, handling, and laying of the pipe and fittings.

2. Use suitable fittings where shown and at connections or where grade or alignment changes require offsets greater than those recommended and approved.

3. Lay all underground pipelines not supported on piles or concrete cradle in select fill bedding material.

4. Close off all lines with bulkheads when pipe laying is not in progress.

B. Related Work Specified in Other Sections Includes:

1.	Section 02222	Excavation - Earth and Rock
2.	Section 02223	Backfilling
3.	Section 02085	Polyvinyl Chloride (PVC) Gravity Pipe and Fittings
4.	Section 02620	High Density Polyethylene (HDPE) Pipe and Fittings
5.	Section 02622	Polyvinyl Chloride (PVC) Force Main Pipe
6.	Section 02676	Leakage Tests
7.	Section 02675	Buried Piping Installation

1.2 REFERENCES

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

1.	ASTM D 2774	- Practice for Underground Installation of Thermoplastic Pressure Piping
2.	AWWA C600	- Installation of Ductile-Iron Water Mains and Their Appurtenances
3.	ASTM A 307	- Specification for Carbon Steel Bolts and Studs, 60000 psi Tensile

4. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, C25, 125, 250, 800

5. ASME B16.21 - Nonmetallic Flat Gaskets for Pipe Flanges

6. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

7. AWWA C115/A21.15 - Flanged Ductile-Iron Pipe With Threaded Flanges

8. ASTM E 165 - Practice for Liquid Penetrant Examination

9. ASTM E 709 - Practice for Magnetic Particle Examination

1.3 DELIVERY, STORAGE AND HANDLING

A. General: Deliver, store and handle all products and materials as specified in Division 1 and as follows:

B. Transportation and Delivery: Take every precaution to prevent injury to the pipe during transportation and delivery to the site.

C. Loading and Unloading: Take extreme care in loading and unloading the pipe and fittings.

1. Work slowly with skids or suitable power equipment, and keep pipe under perfect control at all times.

2. Under no condition is the pipe to be dropped, bumped, dragged, pushed, or moved in any way that will cause damage to the pipe or coating.

D. Sling: When handling the pipe with a crane, use a suitable sling around the pipe.

1. Under no condition pass the sling through the pipe.

2. Use a nylon canvas type sling or other material designed to prevent damage to the pipe and coating.

3. When handling reinforced concrete pipe or uncoated steel or ductile iron pipe, steel cables, chain or like slings are acceptable.

E. Damaged Piping: If in the process of transportation, handling, or laying, any pipe or fitting is damaged, replace or repair such pipe or pipes.

F. Blocking and Stakes: Provide suitable blocking and stakes installed to prevent pipe from rolling.

1. Obtain approval for the type of blocking and stakes, and the method of installation.

G. Storage for Gaskets: Store gaskets for pipe joints in a cool place and protect gaskets from light, sunlight, heat, oil, or grease until installed.

1. Do not use any gaskets showing signs of checking, weathering or other deterioration.

2. Do not use gasket material stored in excess of six months without approval.

1.4 FIELD CONDITIONS

A. Repair of Sanitary Sewers and Services: Rebed, in compacted select fill material, sanitary sewers which cross over the new pipe or which cross under the new pipe with less than 12 inches clear vertical separation. Compact the bedding to densities required for new pipeline construction and extend bedding below the sewer to undisturbed earth. Reconstruct sewers damaged by pipeline construction.

1. Furnish and install all materials and do all work necessary for the reconstruction or repairs of sanitary sewers and services.

2. Provide pipe for reconstruction of sanitary sewers and services meeting the appropriate specification requirements.

3. Provide pipe of the same size as the existing sewer or when the same size is not available, use the next larger size of pipe. Obtain approval of joints made between new pipe and existing pipe.

PART 2 PRODUCTS

A. The materials allowed for buried sewer pipes are PVC or HDPE. Use of ductile iron pipe is not allowed for sewer construction without specific approval of OWNER.

PART 3 EXECUTION

3.1 PREPARATION

A. Dry Trench Bottoms: Lay pipe only in dry trenches having a stable bottom.

1. Where groundwater is encountered, make every effort to obtain a dry trench bottom.

2. If a dry trench bottom has not been obtained due to improper or insufficient use of all known methods of trench dewatering, then the order to excavate below grade and place sufficient select fill material, crushed stone, or 2500 psi concrete over the trench bottom may be given.

3. If all efforts fail to obtain a stable dry trench bottom and it is determined that the trench

bottom is unsuitable for pipe foundation, obtain an order, in writing, for the kind of stabilization to be constructed.

4. Perform trench excavation and backfill in accordance with Sections 02222 and 02223.

3.2 INSTALLATION

A. General: Install all piping in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1. Where pipe deflections are used, do not exceed 80 percent of the maximum deflection limits shown in AWWA C600.

1. Arrange miscellaneous pipelines, which are shown in diagram form on the Plans, clear of other pipelines and equipment.

B. Code Requirements: Provide pipeline installations complying with AWWA C600 for iron pipe, AWWA Manual M11 for steel pipe, ASTM D 2774 for thermoplastic pressure piping, and as modified or supplemented by the Specifications.

C. Pipe Laying - General:

1. For pipelines intended for gravity flow, begin pipeline laying at the low end of a run and proceed upgrade.

2. Generally, lay all pipe with bells pointing ahead.

3. Carefully place each pipe and check for alignment and grade.

4. Make adjustments to bring pipe to line and grade by scraping away or filling in select fill material under the body of the pipe.

5. Wedging or blocking up the pipe barrel is not permitted.

6. Bring the faces of the spigot ends and the bells of pipes into fair contact and firmly and completely shove the pipe home.

7. As the work progresses, clean the interior of pipelines of all dirt and superfluous materials of every description.

8. Keep all lines absolutely clean during construction.

9. Lay pipelines accurately to line and grade.

10. During suspension of work for any reason at any time, a suitable stopper shall be placed in the end of the pipe last laid to prevent mud or other material from entering the pipe.

D. Pipe Laying - Trenches:

1. Lay all pipelines in trench excavations on select fill bedding, concrete cradle or other foundations as shown, specified or ordered in writing.

2. Properly secure the pipe against movement and make the pipe joints in the excavation as required.

3. Carefully grade and compact pipe bedding.

4. Bell Holes:

a. Cut out bell holes for each joint as required to permit the joint to be properly made and allow the barrel of the pipe to have full bearing throughout its length.

b. Thoroughly tamp bell holes full of select fill material following the making of each joint.

E. Other Foundations: Install pipelines laid on other types of foundations as specified for such other foundations or as ordered in writing.

F. Ductile Iron Pipe Mechanical Joints:

1. Assembly: In making up mechanical joints, center the spigot in the bell.

a. Thoroughly brush the surfaces with which the rubber gasket comes in contact with a wire brush just prior to assembly of the joint.

b. Brush lubricant over the gasket just prior to installation.

c. Place the gasket and gland in position, bolts inserted, and the nuts tightened fingertight.

d. Tighten the nuts with a torque wrench so that the gland is brought up toward the pipe evenly. Torque wrenches shall be set as specified in

AWWA C111. Spanner type wrenches not loner than specified in AWWA C111 may be used with the permission of OWNER.

e. Prime all bolts by dipping with a bituminous coating, except the threads. Coat threads immediately prior to installation of nuts.

2. Torques: Apply the following range of bolt torques:

Size (Inches)	Range of Torque - ft. lbs
5/8	45 - 60
¾	75 - 90
1	85 - 100
1 ¼	100

3. Remaking of Joints: If effective sealing is not obtained at the maximum torque listed above, disassemble and reassemble the joint after thorough cleaning.

G. Ductile Iron Pipe Rubber Gasket Joints:

1. Assembly: In making up the rubber gasket joint, brush the gasket seat in the socket thoroughly with a wire brush and wipe the gasket with a cloth.

   a. Place the gasket in the socket with the large round end entering first so that the groove fits over the bead in the seat.

   b. Apply a thin film of lubricant to the inside surface of the gasket that will come in contact with the entering pipe.

   c. Brush the plain end of the pipe to be entered thoroughly with a wire brush and place it in alignment with the bell of the pipe to which it is to be joined.

   d. Exert sufficient force on the entering pipe so that its plain end is moved past the gasket until it makes contact with the base of the socket to make the joint.

2. Positioning: Before proceeding with backfilling, feel completely around the joint using a feeler gauge to confirm that the gasket is in its proper position.

   a. If the gasket can be felt out of position, withdraw the pipe and examine the gasket for cuts or breaks.

   b. If the gasket has been damaged, replace it with a new one before re- installing the pipe.

3. Optional Mechanical Joints: Use mechanical joint fittings that meet the requirements of Section 02630 with the rubber gasket joint pipe when specified or when rubber gasket fittings are not available.

H. Temporary Bulkheads: Provide temporary bulkheads at the ends of sections where adjoining pipelines have not been completed, and in connections built into pipelines where adjoining pipelines or structures have not been completed and are not ready to be connected.

1. Remove bulkheads encountered in connecting sewers or structures included in this Contract, or in pipelines or structures previously built, when they are no longer needed or when ordered.

I. Sleeve Type Couplings: For sleeve type couplings, equally tighten diametrically opposite bolts on the connection so that the gaskets will be brought up evenly all around the pipe.

1. Torque Wrenches: Do the final tightening with torque wrenches set for the torque recommended by the coupling manufacturer.

J. Concrete Encasement: Concrete encasement shall be constructed in accordance with the standard details when:

1. A waterline crosses at a depth which provides less than 18 inches clear distance from sewer lines. Encasement shall extend a minimum 10 feet on each side of the point of crossing. Encase the sewer main unless specifically approved by OWNER.

2. A waterline running parallel to a sewer line provides less than 10 feet separation. Encase the sewer main unless specifically approved by OWNER.

3. The Engineer has ordered the line encased.

The points of beginning and ending of pipe encasement shall be not more than 6 inches from a pipe joint to protect the pipe from cracking due to uneven settlement of its foundation or the effects of superimposed live loads.

K. Valve Box Setting: Install valve boxes vertical and concentric with the valve stem.

1. Satisfactorily reset any valve box which is moved from its original position, preventing the operation of the extension valve stem.

2. Replace any extension valve stem which has been damaged so that it can be operated.

L. Jacking:

1. General: Perform jacking as shown. After jacking is completed, seal the ends of the casing pipe with brick masonry.

a. Jacking Pit: Provide jacking pit of adequate length to provide room for the jacking frame, the jacking head, reaction block, the jacks, rig, and jacking pipe.

b. Construct the pit to be sufficiently wide to allow ample working space on each side of the jacking frame and sufficiently deep so that the invert of the pipe will be at the elevation desired for the completed line when placed on the guide frame.

c. Tightly sheet the pit and keep it dry at all times.

d. Provide adequate protective railings at the top of the pit at all times.

2. Jacking Frame: Design the jacking frame so that it applies a uniform pressure over the entire pipe wall area of the pipe to be jacked.

3. Reaction Blocks: Adequately design the reaction blocks to carry the thrust of the jacks to the soil without excessive soil deflection in a manner which avoids any disturbance of adjacent structures or utilities.

4. Hydraulic Jacks: Use hydraulic jacks in the jacking operation, and take extreme care to hold the casing pipe to exact line and grade.

5. Advance Excavation: Advance excavation by augering.

6. Casing Pipe: Furnish steel casing pipe, unless otherwise specified, conforming to ASTM A 139 with wall thicknesses and pipe diameters shown on the Plans. Provide full penetration butt welded pipe joints.

7. Fill Material: Use fill material, consisting of 1-1/4 pounds of Bentonite per gallon of water, during jacking to fill any voids between the casing pipe and the earth.

M. Identification:

1. Identification Tape: For all types of pipe to be installed, 3-inch detectable marking tape, of appropriate color, shall be placed along the entire pipe length. In all cases, marking tape shall be installed 12 inches to 18 inches below the finished grade during backfill operations. All PVC pipe, PVC fittings, and identification tape shall be color-coded per standards outlined in the Utility Location and Coordinating Council's Uniform Color Code.

2. Locating Wire: A locating tracing wire shall also be installed with PVC, HDPE and fiberglass pipes and shall be a continuous No. 12 insulated copper tracing wire laid in the trench on top of the utility pipe and attached to the pipe at ten (10) foot intervals. This continuous tracing wire shall run along the entire pipe and be stubbed out at valves, pressure clean-outs and air release valves.

3.3 FIELD QUALITY CONTROL

A. Testing: Test pipelines in accordance with Section 02676.

1. Test valves in place, as far as practicable, and correct any defects in valves or connections.

B. Inspection: Clean, inspect, and examine each piece of pipe and each fitting and special for defects before it is installed.

1. Cut away any lumps or projections on the face of the spigot end or the shoulder.

2. Do not use any cracked, broken, or defective pieces in the work.

3. If any defective piece should be discovered after having been installed, remove and replace this piece with a sound piece in a satisfactory manner at no increase in Contract Amount.

3.4 CLEANING

A. General: Thoroughly clean all pipe before it is laid and keep it clean until it is accepted in the completed work.

B. Removal of Materials: Exercise special care to avoid leaving bits of wood, dirt, and other foreign particles in the pipe. If any particles are discovered before the final acceptance of the work, remove and clean the pipe.

3.5 DISINFECTION

A. General: Disinfect all pipelines that are to carry potable water in accordance with Section 02675.

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 02660

PIPE AND FITTINGS – GENERAL

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The work covered by this section and the related sections following consists of providing all labor, equipment, material and supplies and performing all operations required to install the various piping, valves, and accessories for the water lines as specified and shown on the drawings.

1.02 SUBMITTALS

A. Submittals for the various types of pipe and fittings are specified in the individual sections.

B. Shop drawings or catalog cuts shall be submitted for all valves, boxes and restrained joints.

C. Record drawings shall be submitted in accordance with the requirements of Section 01300 – Submittals. The type of pipe used shall also be noted on the drawings.

D. Pipe elevations shall be submitted as specified under "Installation", in this section.

E. The manufacturer shall furnish a sworn affidavit that the pipe, fittings and lining furnished under the Contract or Agreement comply with all applicable provisions of the ANSI and/or AWWA Standards.

F. Reports on pressure and leakage tests shall be submitted by the Contractor in accordance with Section 01300 - Submittals.

G. Reports on bacteriological tests shall be submitted by the Contractor in accordance with Section 01300 - Submittals.

1.03 JOB CONDITIONS

Interruptions to sewer/water service and all plant operations shall be minimized. The Contractor shall submit plans and schedules to the Engineer for approval by the proper authority before any shutdown or any interruption in service takes place.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 INSPECTION

A. All pipe shall be subject to inspection at the factory by the Engineer or Owner. The Contractor shall provide a production schedule in sufficient time so plans can be made for in-plant inspection of the pipe or fittings during production, should it be required.

B. Special markings, if required, shall be plainly marked on the applicable pipe indicating the weight, proper location of the pipe or fitting in the line by reference to layout drawings and schedules, class of pipe, casting period, manufacturer's mark and year pipe was produced.

3.02 TESTS

A. All tests shall be made in the presence of the Owner or Engineer unless waived in writing. The Contractor shall notify the Engineer in sufficient time when tests are being conducted to allow for travel time to the manufacturer's plant.

3.04 INSTALLATION OF UNDERGROUND PIPING

A. See Section 02675 – Buried Pipe Installation

3.05 MISCELLANEOUS INSTALLATION CONDITIONS

A. Water and Sewer Main Crossing

1. Sewers crossing under water mains shall be laid to provide a minimum vertical distance of 18-inches between the invert of the upper pipe and the crown of the lower pipe. All crossings with vertical clearance less than 18 inches shall be made using sewer pipe thickness Class 200 AWWA C900 PVC pipe, and water pipe of Class 51 Ductile iron pipe, for a distance of 10 feet on each side of the crossing. The gravity sewer pipe in these locations shall be backfilled with USCS Class I bedding stone to a height of 6 inches above the crown of the pipe. When water mains cross under a sewer, both mains shall be constructed of C900 Class 200 PVC pipe with joints equivalent to water main standards for a distance of 10 feet on each side of the point of crossing with no

intermediate joints. Additionally, a section of water main pipe shall be centered at the point of crossing.

2. Concrete Encasement: Concrete encasement shall be constructed in accordance with Collier County Standard Details when:

   a. A potable water main crosses at a depth that provides less than 18 inches clear distance from sewer lines. Encase the sewer main unless specifically approved by Collier County Utilities. Encasement shall extend a minimum 10 feet on each side of the point of crossing. Maintain a minimum of 12" between the water main and concrete encasement. Pressure test both pipelines to 150 psi after the concrete has properly cured.

   b. A water main running parallel to a sewer line provides less than 10 feet separation. Encase the sewer main unless specifically approved by Collier County Utilities.

   c. The ENGINEER has ordered the line encased. NO POTABLE WATER MAIN SHALL BE ENCASED IN CONCRETE UNLESS SPECIFICALLY AUTHORIZED BY THE COUNTY.

B. Connection to Existing Mains

1. Where connections are required between new work and existing water mains, the connections shall be made in a thorough and workmanlike manner, using proper specials and fittings to suit the actual conditions.

2. In case a connection is made to an existing fitting in the line, the Contractor shall schedule his work so that digging and locating the existing fittings can be completed prior to starting trench work on the line. The Contractor shall verify the dimensions of all pipe before ordering special fittings and couplings.

C. Harnessing

1. Where harnessing is shown on the drawings or approved by the Engineer, all harnessing rods, clamps, bolts, and nuts shall be coated after assembly. The coating shall be a coal tar or asphalt base bituminous coating approved by the Engineer and applied to at least a 4 mil dry thickness.

3.06 FIELD INSPECTION OF SYSTEM

A. The Contractor shall furnish and install suitable temporary testing plugs or caps for the pipeline, all necessary pressure pumps, hose, pipe connections, meters, gauges and other similar equipment, and all labor required, all without additional compensation, for conducting pressure and leakage tests of the new water main. The Owner may, at his own choice, furnish a water meter and a pressure gauge for use in conducting these tests. The Contractor shall procure and pay for all water required for tests and flushing.

B. Tests shall be made between valves and as far as practicable in sections not exceeding one thousand feet long or as approved by the Engineer. Potable water from an existing water distribution system shall be used. The average test pressure for the water lines shall be 150 psi and this pressure shall be maintained for a period of not less than two hours for uncovered pipes, and for not less than six hours for pipes which have been backfilled before tests are made. The amount of water forced into the line during this time shall be determined and this amount shall be taken as a basis to compute the leakage for twenty-four hours. Pressure shall not vary more than five pounds from the above during the test periods. Allowable leakage shall be computed on the basis of Table 7, Page 16, AWWA Standard C600-82, or the applicable formula for other than 18-foot lengths.

C. All leaks evident at the surface shall be uncovered and repaired regardless of the total leakage as indicated by the test, and all pipes, valves and fittings and other materials found defective under the test shall be removed and replaced at the Contractor's expense. Tests shall be repeated until leakage has been reduced below the allowable amount.

D. If, in the judgment of the Engineer, it is impracticable to follow the foregoing procedures exactly for any reason, modifications in the procedure shall be made as approved by the Engineer. In any event, the Contractor shall be responsible for the ultimate tightness of the piping within the preceding requirements.

E. In testing plant piping, it may be necessary to isolate or disconnect certain equipment while testing piping to protect the equipment or accessories. Piping shall not be tested beyond the ratings of the valves or in other items in the pipelines. Where working pressures are not noted, the Engineer will decide the test pressures required.

3.07 FLUSHING

A. After the water mains have been laid and pressure tested, each run of pipe shall be thoroughly flushed so as to remove all debris and foreign matter from the lines. Flushing will ordinarily be done by opening fire hydrants or blowoffs along the pipeline. Where fire hydrants or blowoffs are not available or are of insufficient capacity to permit adequate flushing, the pipeline

shall be opened and flumes or piping shall be provided by the Contractor to waste the water to the nearest approved disposal point. Sufficient flushing water shall be introduced into the mains to produce a velocity of not less than 2½ feet per second, and this rate of flow shall be continued until the discharge is clear and no evidence of silt or foreign matter is visible.

B. See Related Section 02670 – Flushing, Testing, and Disinfection

3.08 DISINFECTION AND TESTS

A. See Section 02670 – Pressure Pipe Testing.

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 02668

FITTINGS, VALVES AND APPURTENANCES

PART 1 - GENERAL

1.01 PERFORMANCE

A. Section generally defines responsibilities unless otherwise indicated, for the following:

1. Fittings
2. Air Release Valves
4. Plug Valves
5. Check Valves
6. Water Service Connections
7. Valve Boxes

1.02 RELATED SECTIONS

A. All of Division 1

B. Section 02000 – Utility Construction

C. Section 02660 – Pipe and Fittings – General

D. Section 15120 – Plug Valves and Check Valves

1.03 REFERENCES

A. ANSI/AWWA C104/A21.4 (Latest Revision) – Cement mortar lining for ductile iron pipe and fittings for water.

B. ANSI/AWWA C110/A21.10 (Latest Revision) – Ductile iron and grey iron fittings 3 inch through 48 inch for water and other liquids.

C. ANSI/AWWA C111/A21.11 (Latest Revision) – Rubber gasket joints for ductile iron and grey iron pressure pipe and fittings.

D. ANSI/AWWA C600 (Latest Revision) – Installation of ductile iron water mains and appurtenances.

E. ANSI/AWWA C153/A21.53 (Latest Revision) – Ductile Iron Compact Fittings For Water Service.

F. Collier County Utilities Standards Manual

PART 2 - PRODUCTS

2.01 GENERAL:

A. Valves and appurtenances shall be of the size shown on the Drawings and equipment of the same type shall be from one manufacturer.

B. Valves and appurtenances shall have the name of the maker and the working pressure for which they are designed cast in raised letters upon the valve body.

2.02 MATERIALS

A. Fittings:

1. Mechanical joint fittings to be Compact Ductile Iron (Class 350 AWWA C-153 only).

2. Provide flanged fittings at above ground applications appropriate to the service use and maximum working pressure of the fitting and be in accordance with AWWA C104, AWWA C110, flanged fittings, bolts, gaskets and installation.

3. Provide flanged fittings with full-face black neoprene gaskets and 316 stainless steel bolts.

4. Exterior of below grade fittings shall have factory applied bituminous coating, coal tar varnish or asphalt base paint, minimum one-mil thick.

5. Interior of fittings shall be lined as specified for the pipe to which they are attached.

6. Acceptable manufacturers include: U.S. Pipe, Clow, American Darling, Kennedy, Mueller, Ford or equivalent by U.S. manufacturer.

B. Air Release Valves:

1. Air release valves shall be installed as shown on the drawings and shall be the automatic type of the conical-body design.

2. Air release valves shall have a reinforced nylon body, foamed polypropylene float, Buna-N or EPDM seals and stainless steel trim.

3. Provide air release valves with a vacuum check to prevent air from re-entering the line.

4. Air release valve fittings shall be threaded.

5. Air release valves shall be ARI Model D-025, or equivalent.

C. Plug Valves

1. Plug valves for pipe four inches and greater shall have a ductile iron body with a minimum 80% port opening and bi-directional pressure rating.

2. Below grade installations shall be mechanical joint only with side actuated gear operator with two-inch operating nut and standard valve box.

3. Above grade installations four-inch to eight-inch shall be flanged with standard ¼ turn operator, with two-inch square operating nut. Ten-inch and larger shall be wheel operated.

4. Plug valves shall have resilient plug facing.

5. Plug valves shall be manufactured by U.S. Pipe, Clow, American Darling, Kennedy, Mueller, Ford or equivalent by U.S. manufacturer.

D. Check Valves

1. Check valve bodies shall be cast iron per ASTM A126 Class B, having integral (not wafer) flanges.

2. The seat shall be centrifugally cast bronze with an O-ring seal and be locked in place with stainless steel lock screws and be field replaceable, without the use of special tools.

3. Swing check valves shall have a shaft of single and continuous stainless steel, extending both sides of the body with a lever and weight.

4. The air cushion cylinder, when specifically required, shall be constructed of corrosion resistant material and the piston shall be totally enclosed within the cylinder and not open at one end. The air cushion cylinder assembly shall be externally attached to either or both sides of the valve body and shall permit adjustability to cushion the closure of the valve. Cushioning shall be by air trapped in the cushion cylinder, which shall be fitted with a one-way adjustable control check valve to cushion disc contact to the seat at the shut-off point. The bottom cylinder head shall be swivel mounted and not rigid to follow the change of force angles as the lever raises or lowers to open or close the check valve. Valve shall prevent backflow on normal pump shut off or power failure, at zero velocity and be watertight. The disc shall be cast iron utilizing a double clevice hinge connected to a ductile iron disc arm. The disc arm assembly shall be suspended from a stainless steel shaft, which passes through a seal retainer on both sides of the valve body.

5. Valve exterior to be factory-painted with Red Oxide Phenolic Primer Paint as accepted by the FDA for use in contact with Potable Water. Materials shall be certified to the following ASTM specifications:
   a. Body, cover & disc - Cast Iron - ASTM A126, Class B
   b. Disc Arm - Ductile Iron - ASTM A536
   c. Seat - Aluminum Bronze or Stainless Steel - ASTM B148, ASTM A276
   d. Disc Seat - Buna-N or metal
   e. Cushion cylinder - Corrosion-resistant Commercial material

6. Check valves shall be manufactured by U.S. Pipe, Clow, American Darling, Kennedy, Mueller, Ford or equivalent by U.S. manufacturer.

E. Water Service Connections

1. Service Saddles
   a. Service saddles or fittings shall be used with taps to all types of pipe. Gasket shall be cemented in place and confined in a retaining groove. Saddles shall be cast iron saddles with double brass straps.
   b. Tapping sleeves and valves shall be used for all taps.

c. Service saddles on ductile iron pipe shall be Ford 202B, and on PVC pipe shall be Ford S 90 or equivalent, with AWWA threaded corporation stop connections.

2. Water Meter and Backflow Preventer
   a. Water meters shall be Neptune autoread meters **(no substitutions)** per IWSD standards.
   b. Backflow preventers shall be Wilkins Model 975 XL **(no substitutions)** per IWSD standards.
   c. Water meters and backflow preventers shall be of the sizes indicated on the drawings.

3. Corporation Stops for Service Connections
   a. Corporation stops shall meet the requirements of AWWA C800, and shall be Mueller H15008, or equivalent; ends AWWA thread x compression, CTS.

4. Water Service Tubing
   a. Water service connection tubing shall be polyethylene municipal service tubing.
   b. Polyethylene tubing shall meet the requirements of AWWA Standard C901. Polyethylene tubing shall be 3406 polyethylene.

5. Polyethylene Service Tube Stiffeners
   a. A solid ring, stainless steel insert shall be installed with each and every compression connections made with polyethylene tubing.

F. Valves for Buried Service

1. Valves for buried service shall meet the requirements as specified herein for interior except that buried valves shall have mechanical joint ends.

2. Buried valves shall have cast-iron two-piece valve boxes, valve boxes shall be provided with suitable heavy bonnets to extend to such elevation at the finished grade surface as directed by the ENGINEER. The barrel shall be two-piece, screw type. The upper section shall have a flange at the bottom having sufficient bearing area to prevent settling, shall be designed so as to prevent the transmission of surface loads directly to the valve or piping, and shall be complete with cast iron covers. Covers shall have "WATER" or “SEWER” cast into the top to coincide with the application. The covers shall be so constructed as to prevent tipping or rattling. Valve boxes located in paved roadways or sidewalks shall have locking covers. Valve boxes shall be Model 461 manufactured by Tyler/Union or equivalent.

3. Valve boxes shall be provided with suitable heavy bonnets and will extend to an elevation at or slightly above the finished grade surface as directed by the Engineer. Where valves are located out of pavement, the boxes shall be adjusted to finished grade with a concrete collar as shown in the Details.

4. Valve boxes shall be of the heavy duty, traffic bearing cast iron, adjustable screw type with a drop cover. Valve box assembly shall consist of a bottom section, top section and cover cast from gray iron, formulated to ASTM specification A-48 latest revision, minimum tensile of 21,000 psi and shall be free from blowholes, shrinkage or other imperfections not true to pattern. The shaft size shall be 5 1/4" and the adjustable length

shall be from 18" to 36". The wall thickness shall be 1/4". The weight of the assembly shall be 61 pounds ± 2 pounds, with the cover weight being a minimum of 13 pounds.

5. The name of the manufacturer and foundry of origin shall be cast into each of the components of the assembly in legible form. The assembly shall be suitable for highway traffic wheel loads of 16,000 pounds and shall withstand a proof load test of 25,000 pounds without failure or permanent deflection.

6. Covers that have "Water" cast into the top shall be painted blue. Covers that have "Sewer" cast into the top shall be painted green.

7. Valves shall have actuating nuts extended to within six inches of the top of valve box cover.

PART 3 - EXECUTION

NOT USED

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 02670

PRESSURE PIPE TESTING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Pressure Testing of new wastewater piping subject to more than 5 psi working pressure as required by Contract Documents.

B. Furnish pumps, hoses, piping, fittings, meters, gauges, chemicals and labor to conduct specified testing.

C. Testing shall be repeated at the Contractor's expense until satisfactory results are achieved.

1.02 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

A. Section 01300 – Submittals

1.03 SUBMITTALS

A. Test Reports: Indicate results comparative to specified requirements. Submit two (2) copies of test results to Engineer in accordance with Submittal specifications.

B. Hydrostatic Test Report:

1. Time and Date of Testing.

2. Name of Person/Persons conducting test and present during test and Company name.

3. Test locations.

4. All pressure gauge locations w/pressure at time.

5. Allowable leakage per specifications.

6. Actual leakage during test with finishing time and pressure.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with ANSI/AWWA C651, C652, C653, and C654, latest revisions.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable Florida DEP requirements for performing the work of this Section.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that pipes have been cleaned, inspected, and tested.

B. Coordinate scheduling activity with start-up, testing, and demonstration procedures, including coordination with related systems.

3.02 FLUSHING AND PRESSURE TESTING - PIPING

Furnish and install temporary testing plugs or caps for the pressure lines, pressure pumps, hose, pipe connections, meters, gauges and other similar equipment, and provide labor required, all without additional compensation for conducting pressure and leakage tests and flushing of the new lines. Flushing and pressure testing shall be conducted in the following order.

A. After piping lines have been installed and before pressure testing and final connections to equipment, each run of pipe shall be thoroughly flushed so as to remove debris and foreign matter from the piping and equipment. Clean and flush piping using potable water. Sufficient flushing water shall be introduced into the piping to produce a velocity of not less than 3.0 feet per second, and this rate of flow shall be continued until the discharge is clear and no evidence of silt or foreign matter is visible. Pigging of piping systems should be considered where flushing is not practical or feasible. Non-abrasive pigs shall be employed.

B. Pressure testing piping systems:

1. The test pressure shall be 100 psi, unless otherwise directed by the Engineer, and this pressure shall be maintained for a period of not less than two hours. Tests shall be made between valves and as far as practicable and as approved by the Engineer. Potable water from the onsite distribution system shall be used. Pressure shall not vary more than one (1) psi for low pressure piping (less than 20 psi), or five (5) psi for other piping during the test periods or as approved by the Engineer. No leakage shall be allowed.

2. Leaks evident at the surface shall be uncovered and repaired regardless of the total leakage as indicated by the test, and pipes, valves, fittings and other materials found defective under the test shall be removed and replaced at the Contractor's expense. Tests shall be repeated until leakage has been reduced to zero (0).

3. Should, in the judgement of the Engineer, it not be practical to follow the foregoing procedures exactly for any reason, modifications in the procedure shall be made as approved by the Engineer. In any event, the Contractor shall be responsible for the ultimate water tightness of the piping within the preceding requirements.

END OF SECTION

SECTION 02675

BURIED PIPING INSTALLATION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The work covered by this section and the related sections following consists of providing labor, equipment, material and supplies and performing operations required to install the various piping, valves, and accessories for the pipe lines as specified and shown on the drawings.

B. Related Work Specified Elsewhere:

1. Section 02222 – Excavation

2. Section 02223 – Backfilling

1.02 SUBMITTALS

A. Submittals for the various types of pipe and fittings are specified in the individual sections.

B. Shop drawings or catalog cuts shall be submitted for valves, valve boxes and restrained joints.

C. Record drawings shall be submitted in accordance with the requirements of Section 01300 - Submittals, and Paragraph 1.04 of Section 01700 - Contract Closeout. The type of pipe used shall also be noted on the drawings.

D. Pipe elevations shall be submitted as specified under "Installation", in this section.

E. The manufacturer shall furnish a sworn affidavit that the pipe, fittings and lining furnished under the Contract or Agreement comply with all applicable provisions of the ANSI and/or AWWA Standards.

F. Submit reports on pressure and leakage tests in accordance with Section 01300 - Submittals.

1.03 JOB CONDITIONS

A. Interruptions to utility services shall be minimized. Submit plans and schedules to the Engineer for review by the proper authority before any shutdown or interruption in services takes place.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 INSPECTION

A. Pipe shall be subject to inspection at the factory by the Engineer or Owner. Provide a production schedule in sufficient time so plans can be made for in-plant inspection of the pipe or fittings during production.

B. Special markings, if required, shall be plainly marked on the applicable pipe indicating the weight, proper location of the pipe or fitting in the line by reference to layout drawings and schedules, class of pipe, casting period, manufacturer's mark and year pipe was produced.

3.02 TESTS

Tests shall be made in the presence of the Owner or Engineer unless waived in writing. Notify the Engineer in sufficient time when tests are being conducted to allow for travel time to the manufacturer's plant.

3.03 INSTALLATION OF UNDERGROUND PIPING

A. Excavation, trenching and backfilling for the installation of underground piping system shall be as specified in Sections 02222 and 02223. Pipe shall be laid in a level trench. Irregularities shall be smoothed out or filled with sand and tamped. Holes shall be scooped out where the bells occur leaving the entire barrel of the pipe bearing on the pipe bed.

B. Laying of the pipe shall be commenced immediately after the excavation is started, and every means must be used to keep pipe laying closely behind the trenching. The Engineer may stop trenching when the trench is open more than 150 feet in advance of the pipe laying operation. Pipe must be laid in accordance with the manufacturer's instructions and recommendations. Damaged or unsound pipe or fittings will be removed and replaced. Before jointing of the pipe, lumps, blisters, excess coating material or oil shall be removed from the bell and spigot ends of the pipe. Pipe lines shall be thrust blocked or restrained to prevent movement of lines under pressure. Provide pipe restraints or concrete thrust blocking. Concrete shall be a minimum 2,500 psi. For ductile iron pipe, thrust or anchor blocks or restrained joints shall be installed at bends, tees, crosses, wyes, plugs, and reducers as shown in details of typical thrust and anchor block placements on the drawings. The number of feet of pipe with restrained joints necessary for each size pipe shall be as shown on the Standard Detail Drawings.

C. Where there is no adequate natural foundation upon which to construct a pipe bed, the

pipe shall be constructed on a prepared stabilized subgrade or rock bedding of Class I materials as defined in ASTM D2321. Unsuitable subgrade materials shall be replaced or stabilized. Gravel or graded limerock used for pipe bedding, when ordered in writing, shall be paid for under bid item for such material. Where dewatering is required, Class I materials shall be used as described in ASTM D2321.

D. Pipe and fittings shall be strung out along the route of construction with the spigots pointing in the direction of the flow. Pipe shall be placed where it will cause least interference with traffic. Pipe shall be handled by mechanical equipment. Before the pipe is lowered into the trench, it shall be swabbed or brushed out to insure that no dirt or foreign material enters the finished line. Trench waters shall be kept out of the pipe and the pipe kept closed by means of a test plug whenever work is not in progress. Provide the means for dewatering the trench and include the cost in the price for installing the pipe.

E. Deflections from a straight line or grade made necessary by vertical curves or horizontal curves or offsets shall not exceed the manufacturer's recommendations. If the specified or required alignment requires deflection in excess of those recommended, provide special bends as reviewed by the Engineer or a sufficient number of shorter lengths of pipe to provide angular deflections within the required limit.

F. Joints shall be watertight and any leaks or defects discovered shall be immediately repaired to the satisfaction of the Engineer. Any pipe which has been disturbed after being laid shall be taken up, the joints cleaned and the pipes re-laid. Any superfluous material inside the pipe shall be flushed or removed by means of an approved follower or scraper after joints are made. Installation of fittings and pipe joints shall be in accordance with the manufacturer's recommendations.

G. Where water mains are stubbed out with a reducer and valve, in addition to thrust blocks, the stubouts shall have restrained joints from the valve back to the tee.

H. For the protection of exposed reinforcing in anchor blocks, furnish and apply two coats of protective coating.

I. Before backfilling, take elevations on the top of the pipe barrel at 100-foot intervals along the pipeline and at any change in grade. These elevations shall be submitted to the Engineer. See Section 01300 for additional requirements.

J. Plastic pipe shall be installed in accordance with the provisions of ASTM D2321, including those provisions in respect to compaction of bedding and haunching material. Class IV or Class V materials as defined in ASTM D2321 shall not be used for bedding, haunching or initial backfill.

3.04 MISCELLANEOUS INSTALLATION CONDITIONS

A. Water and Sewer Main Crossing

1. Reference CCU's Standard Separation Statement included within the Contract Documents. Sewers crossing under water mains shall be laid to provide a minimum vertical distance of 18-inches between the invert of the upper pipe and the crown of the lower pipe. Crossings with vertical clearance less than 18 inches shall be made using sewer pipe thickness Class 200 AWWA C900 PVC pipe, and water pipe of Class 51 Ductile iron pipe, for a distance of 10 feet on each side of the crossing. The gravity sewer pipe in these locations shall be backfilled with USCS Class I bedding stone to a height of 6 inches above the crown of the pipe. When water mains cross under a sewer, both mains shall be constructed of C900 Class 200 PVC pipe with joints equivalent to water main standards for a distance of 10 feet on each side of the point of crossing with no intermediate joints. Additionally, a section of water main pipe shall be centered at the point of crossing.
2. Concrete Encasement: Concrete encasement shall be constructed in accordance with Collier County Standard Details when:
    a. A potable water main crosses at a depth that provides less than 18 inches clear distance from sewer lines. Encase the sewer main unless specifically approved by Immokalee Water & Sewer District. Encasement shall extend a minimum 10 feet on each side of the point of crossing. Maintain a minimum of 12" between the water main and concrete encasement. Pressure test both pipelines to 150 psi after the concrete has properly cured.
    b. A water main running parallel to a sewer line provides less than 6 feet separation. Encase the sewer main unless specifically approved by Immokalee Water & Sewer District.
    c. The ENGINEER has ordered the line encased. NO POTABLE WATER MAIN SHALL BE ENCASED IN CONCRETE UNLESS SPECIFICALLY AUTHORIZED BY THE ENGINEER.

B. Connection to Existing Mains

1. Where connections are required between new work and existing mains, the connections shall be made in a thorough and workmanlike manner, using specials and fittings to suit the actual conditions.

2. In case a connection is made to an existing fitting in the line, schedule the work so that digging and locating the existing fittings can be completed prior to starting trench work on the line. Verify the dimensions of pipe before ordering special fittings and couplings.

C. Harnessing

1. Where harnessing is shown on the drawings or accepted by the Engineer, harnessing rods, clamps, bolts, and nuts shall be coated after assembly. The coating shall be a coal tar or asphalt base bituminous coating reviewed by the

Engineer and applied to at least a 4 mil dry thickness.

3.05 FIELD INSPECTION OF SYSTEM

A. Furnish and install suitable temporary testing plugs or caps for the pipeline, pressure pumps, hose, pipe connections, meters, gauges and other similar equipment, and labor required for conducting pressure and leakage tests of the new main. The Owner may, at his own choice, furnish a water meter and a pressure gauge for use in conducting these tests. Procure and pay for water required for tests and flushing.

B. Tests shall be made between valves and as far as practicable in sections not exceeding one thousand feet long or as designated by the Engineer. Potable water from an existing water distribution system shall be used. The average test pressure for the water lines shall be as specified on the plans. Maintain the test pressure for a period of not less than the specified time and in no case less than two hours for uncovered pipes, and for not less than six hours for pipes which have been backfilled before tests are made. The amount of water forced into the line during this time shall be determined and this amount shall be taken as a basis to compute the leakage for twenty-four hours. See Section 02670, Flushing and Testing, for further details.

C. Leaks evident at the surface shall be uncovered and repaired regardless of the total leakage as indicated by the test, and pipes, valves and fittings and other materials found defective under the test shall be removed and replaced. Tests shall be repeated until leakage is zero (0).

D. If, in the judgment of the Engineer, it is impracticable to follow the foregoing procedures, modifications in the procedure shall be made after review by the Engineer. **Provide for the ultimate tightness of the piping** within the preceding requirements.

E. In testing piping, it may be necessary to isolate or disconnect certain equipment while testing piping to protect the equipment or accessories. Piping shall not be tested beyond the ratings of the valves or any other items in the pipelines. Where working pressures are not noted, the Engineer will decide the test pressures required.

3.06 FLUSHING

A. See Section 02670 – Pressure Pipe Testing

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 02675

DISINFECTION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Disinfection of all pipelines, tanks, structures, conduits and equipment which are to store, handle or carry potable water. Furnish all labor, water, chemicals and equipment, including taps, corporation stops, temporary pumps and other items necessary to perform the Work, except as otherwise specified.

1.2 REFERENCES

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

1. AWWA C651 - Disinfecting Water Mains
2. AWWA C652 - Disinfection of Water-Storage Facilities

1.3 QUALITY ASSURANCE

A. Disinfection Standards: Disinfect in accordance with AWWA C651 for water mains and AWWA C652 for water storage facilities and equipment.

B. Chlorinated Water Disposal: Dispose of old highly chlorinated water in accordance with applicable regulations.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 WATER MAIN DISINFECTION

A. Following acceptable pressure testing, disinfect all sections of the water distribution system and receive approval thereof from the appropriate agencies, prior to placing in service. Advance notice of 24 hours shall be provided to the County before disinfecting procedures start. The disinfection shall be accomplished in accordance with the applicable provisions of AWWA Standard C601, "Disinfecting Water Main" and all appropriate approval agencies.

B. The disinfecting agent shall be free chlorine in aqueous solution with sustained concentration for 12 hours or more of not less than 50 parts per million. Chlorine may

be derived from Chlorine gas, or 70% (high test) calcium hypochlorite (HTH or Perchloron, or equal). Administration may be by any of the several methods described in AWWA Standard C601 as proposed by the CONTRACTOR and approved by the ENGINEER. Proposals as to method must be made prior to commencement of the disinfection process.

C. Following contact with chlorine solution, the system shall be thoroughly flushed out. Samples shall then be taken using sterile containers obtained from the County Health Department. Samples shall be taken by the CONTRACTOR and delivered by him to the County Health Department or approved laboratory for analysis.

D. If samples do not demonstrate satisfactory results, the disinfection procedure shall be repeated until two series of satisfactory samples are obtained, the period between such series of samples to be a minimum of 24 hours.

3.2 DISINFECTION PROCEDURES FOR TANKS

A. Disinfect potable water storage tanks and equipment in accordance with AWWA C652, Method 2 or 3, using sodium hypochlorite.

1. In Method 2, spray method, spray the entire interior surface of the tank with chlorinated water containing 200 mg/l of available chlorine. After spraying, allow the tank to stand at least two hours before filling with fresh water.

B. After disinfection, allow the tanks and equipment to overflow until the chlorine residual is approximately 2 mg/l.

END OF SECTION

SECTION 02676

LEAKAGE TESTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Testing for any signs of leakage in all pipelines and structures required to be watertight.

1. Test gravity sewers and drain lines by low pressure air testing.

2. Test all other pipelines with water under the specified pressures.

B. Operation of Existing Facilities: Conduct all tests in a manner to minimize as much as possible any interference with the day-to-day operations of existing facilities or other contractors working on the site.

1.2 PERFORMANCE REQUIREMENTS

A. Written Notification of Testing: Provide written notice when the work is ready for testing, and make the tests as soon thereafter as possible.

1. Personnel for reading meters, gauges, or other measuring devices, will be furnished.

2. Furnish all other labor, equipment, air, water and materials, including meters, gauges, smoke producers, blower, pumps, compressors, fuel, water, bulkheads and accessory equipment.

1.3 REFERENCES

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

1. AWWA C 600 - Installation of Ductile-Iron Water Mains and Their Appurtenances
2. AWWA C 605 - Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water

1.4 SUBMITTALS

A. General: Provide all submittals, including the following, as specified in Division 1.

B. Testing Report: Prior to placing the sewer system in service submit for review and approval a detailed bound report summarizing the leakage test data, describing the test procedure and showing the calculations on which the leakage test data is based.

1. Reference Sewer Line Data

a. For Low Pressure Air Testing

(1) The length and diameter of the section of line tested (MH to MH) including any laterals.

(2) A complete description of test procedures and methods, including:

(a) Trench backfilling and sewer cleaning status

(b) Type of plugs used and where

(c) Depth of sewer, and ground water pressure over sewer pipe

(d) Stabilization time period and air pressure

(e) Actual air test pressures used if ground water is present

(f) The allowed time by specifications

(g) The actual test time

(h) The air pressure at beginning and end of test

(3) The name of the inspector/tester and the date(s) and time(s) of all testing, including any retesting.

(4) A description of any repairs made.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 LEAKAGE TESTING

A. All new sewer and water pipelines installed shall be tested for leakage. The test used will be Hydrostatic Testing for pressure lines and Low Pressure Air Testing for gravity lines. Tests to be performed will be indicated by the ENGINEER and witnessed by the ENGINEER and the OWNER representatives.

1. Flushing

a. All mains shall be flushed to remove all sand and other foreign matter. The velocity of the flushing water shall be at least 4 fps. Flushing shall be terminated at the direction of the ENGINEER. Dispose of the flushing water without causing a nuisance or property damage.

b. Temporary flush out connections shall be installed on all dead end water mains at the locations shown on the Drawings and in accordance with the detail shown in Section 9 of the Lee County Utilities Operations Manual.

2. Hydrostatic Testing

Polyvinyl Chloride (PVC) Pipe Water Mains – in accordance with AWWA C605

Testing shall be in accordance with the applicable provisions as set forth in the most recent edition of AWWA Standard C605.

General. The constructor shall provide measurement gauges and recording devices for the test, including pump, pipe, connections, and other necessary apparatus, unless otherwise specified by the purchaser, and shall provide the necessary assistance to conduct the test. Prior to testing, the constructor shall place sufficient backfill to prevent pipe movement. When local conditions require that the trenches be backfilled immediately after the pipe has been laid, the testing may be carried out after backfilling has been completed but before placement of permanent surfacing. The constructor shall ensure that thrust-blocking or other types of restraining systems will provide adequate restraint prior to pressurizing the pipeline.

Cross-connection control. When existing water mains are used to supply test water, they should be protected from backflow contamination by temporarily installing a double check-valve assembly between the test and supply main or by other means approved by the purchaser. Prior to pressure and leakage testing, the temporary backflow protection should be removed and the main under test isolated from the supply main.

Procedure. Tests shall be performed only after the pipeline has been properly filled, flushed, and purged of air. The specified test pressure shall be applied by means of an approved pumping assembly connected to the pipe in a manner satisfactory to the purchaser. The test pressure shall not exceed the design pressure of the pipe, fittings, valves, or thrust restraints. If necessary, the test pressure shall be maintained by additional pumping for the specified time. During tests, the system and exposed pipe, fittings, valves, and hydrants shall be carefully examined for leakage. Visible leaks shall be stopped. Defective elements shall be repaired or removed and replaced and the test repeated until the test requirements have been met.

Test duration. The duration of the hydrostatic test shall be 2 hr.

Test pressure. The hydrostatic test pressure shall not be less than 1.25 times the maximum anticipated sustained working pressure at the highest point along the test section unless the pressure exceeds the design pressure limit for any pipe, thrust restraint, valve fitting, or other appurtenance of the test section. In no case shall the test pressure exceed the design pressure limit for any pipe, thrust restraint, valve, fitting, or other appurtenance of the test section.

Test allowance. The testing allowance shall be defined as the quantity of water that must be supplied to the pipe section being tested to maintain a pressure within 5 psi of the specified hydrostatic test pressure. No installation will be accepted if the quantity of makeup water is greater than that determined by the formula:

Where:

$$Q = \frac{LD\,(P)^{1/2}}{148{,}000}$$

Q = quantity of makeup water, in gallons per hour
L = length of pipe section being tested, in ft
D = nominal diameter of the pipe, in in.
P = average test pressure during the hydrostatic test, in pounds per square in. (gauge)

These formulas are based on a testing allowance of 10.5 gpd/mi/in. of nominal diameter at a pressure of 150 psi.

Metal-seated valves. When testing against closed metal-seated valves, an additional allowance per closed valve of 0.0078 gph/in. of nominal valve size shall be allowed.

Hydrant. When hydrants are in the test section, the test shall be made against closed hydrant valves.

Visible leaks. Visible leaks shall be repaired, regardless of the amount of leakage.

Other Water Mains – in accordance with AWWA C600

Testing shall be in accordance with the applicable provisions as set forth in the most recent edition of AWWA Standard C600.

Perform hydrostatic testing of the system as set forth in the following, and shall conduct said tests in the presence of representatives from the OWNER and other authorized agencies, with 48 hours advance notice provided.

Piping and appurtenances to be tested shall be within sections between valves unless alternate methods have received prior approval from the OWNER. Testing shall not proceed until concrete thrust blocks are in place and cured, or other restraining devices installed. All piping shall be thoroughly cleaned and flushed prior to testing to clear the lines of all foreign matter. While the piping is being filled with water, care shall be exercised to permit the escape of air from extremities of the test section, with additional release cocks provided if required.

Hydrostatic testing shall be performed with a sustained pressure for a minimum of two (2) hours at 150 psi pressure or 2-1/2 times working pressure, whichever is higher, unless otherwise approved by OWNER, for a period of not less than two (2) hours. The allowable rate of leakage shall be less than the number of gallons per hour determined by the following formula:

$$L = \frac{SD\,(P)^{1/2}}{133{,}200}$$

Where,

L = Allowable leakage in gallons per hour;
S = Length of pipe tested in feet;
D = Nominal diameter of the pipe in inches;
P = Average test pressure maintained during the leakage test in pounds per square inch

For 150 psi, $L = (9.195 \times 10^{-5})\,SD$

The testing procedure shall include the continued application of the specified pressure to the test system, for the one hour period, by way of a pump taking supply from a container suitable for measuring water loss. The amount of loss shall be determined by measuring the volume displaced from said container.

Should the test fail, necessary repairs shall be accomplished by the CONTRACTOR and the test repeated until results are within the established limits. The CONTRACTOR shall furnish the necessary labor, water, pumps, and gauges at specified location(s) and all other items required to conduct the required testing and perform necessary repairs.

General. All sanitary sewers and associated service lines shall be constructed watertight to prevent infiltration and/or exfiltration. All new sanitary sewer systems will be subject to low pressure air testing.

3. Low Pressure Air Test

After completing backfill of a section of gravity sewer line, conduct a Line Acceptance Test using low pressure air. The test shall be performed using the below stated equipment, according to state procedures and under the supervision of the ENGINEER and in the presence of a OWNER representative, with 48 hours advanced notice provided.

a. Equipment:

1. Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be inspected.

2. Pneumatic plugs shall resist internal bracing or blocking.

3. All air used shall pass through a single control panel.

4. Three individual hoses shall be used for the following connections:

a. From control panel to pneumatic plugs for inflation.

b. From control panel to sealed line for introducing the low pressure air.

c. From sealed line to control panel for continually monitoring the air pressure rise in the sealed line.

b. Procedures:

All pneumatic plugs shall be seal tested before being used in the actual test installation. One length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be checked. Air shall be introduced into the plugs to 25 psi. The sealed pipe shall be pressurized to 5 psi. The plugs shall hold against this pressure without bracing and without movement of the plugs out of the pipe.

After a manhole to manhole reach of pipe has been backfilled and cleaned and the pneumatic plugs are checked by the above procedure, the plugs shall be placed in the line at each manhole and inflated to 25 psi. Low pressure air shall be introduced into this sealed line until the internal air pressure reaches 4 psi greater than the average back pressure of any ground water that may be over the pipe. At least two (2) minutes shall be allowed for the air pressure

to stabilize. After the stabilization period (3.5 psi minimum pressure in the pipe), the air hose from the control panel to the air supply shall be disconnected. The portion of line being tested shall be termed "Acceptable", if the time required in minutes for the pressure to decrease from 3.5 to 2.5 psi (greater than the average back pressure of any ground water that may be over the pipe) is greater than the time shown for the given diameters in the following table:

Pipe Diameter (In Inches)	Minutes
8	4.0
10	5.0
12	5.5
16	7.5
18	8.5
24	11.5

Time in minutes = 0.472 D
D = Diameter of pipe in inches.

In areas where ground water is known to exist, the CONTRACTOR shall install capped pipe adjacent to the top of one of the sewer lines. This shall be done at the time the sewer line is installed. Immediately prior to the performance of the Line Acceptance Test, the ground water shall be determined by removing the pipe cap, and a measurement of the height in feet of water over the invert of the pipe shall be taken. The height in feet shall be divided by 2.3 to establish the pounds of pressure that will be added to all readings. (For example, if the height of water is 11-1/2 feet, then the added pressure will be 5 psi. This increases the 3.5 psi to 8.5 psi, and the 2.5 psi to 7.5 psi. The allowable drop of one pound and the timing remain the same).

If the installation fails to meet this requirement, the CONTRACTOR shall, at his own expense, determine the source of leakage. He shall then repair or replace all defective materials and/or workmanship.

3.2 LEAKAGE TESTS FOR STRUCTURES

A. Structure Leakage Testing: Perform leakage tests of wet wells, tanks, vaults and similar purpose structures before backfilling, by filling the structure with water to the overflow water level and observing the water surface level for the following 24 hours.

1. Make an inspection for leakage of the exterior surface of the structure, especially in areas around construction joints.

2. Leakage will be accepted as within the allowable limits for structures from which there are no visible leaks.

3. If visible leaks appear, repair the structure by removing and replacing the leaking portions of the structure, waterproofing the inside, or by other methods approved.

4. Water for testing will be provided by the OWNER at the CONTRACTOR's expense.

END OF SECTION

SECTION 034100

PRECAST CONCRETE STRUCTURES

PART 1 GENERAL

1.1 SCOPE OF WORK

A. Furnish all materials, labor, and equipment and construct manholes, wet wells, valve pits, meter pits, and accessory items, consisting of precast sections as shown on the Drawings and as specified herein.

B. The forms, dimensions, concrete, and construction methods shall be approved by the ENGINEER in advance of construction.

C. These specifications are intended to give a general description of what is required, but do not purport to cover all of the structural design details which will vary in accordance with the requirements of the equipment as offered. It is, however, intended to cover the furnishing, shop testing, delivery, and complete installation of all precast structures whether specifically mentioned in these specifications or not.

D. The supplier of the precast manholes, wet wells, valve pits, meter pits, and accessory items shall coordinate his work with that of the CONTRACTOR to the end that the unit will be delivered and installed in the excavation provided by the CONTRACTOR, in accordance with the CONTRACTOR's construction schedule.

E. Coordinate the precast structures fabrication with the equipment supplied to achieve the proper structural top slab openings, spacings, and related dimensions for the selected equipment frames and covers. The top slabs, frames, covers, and subsurface structures shall be capable of supporting a live load of 150 pounds per square foot.

1.2 SUBMITTALS

A. Submit to the ENGINEER, as provided in the General Conditions, shop drawings showing details of construction, reinforcing and joints.

B. Shop Drawings

1. Content

a. Dimensions and finishes

b. Estimated camber

c. Reinforcing and connection details

d. Anchors

e. Lifting and erection inserts

f. Other items cast into members

2. Show location of unit by same identification mark placed on member.

3. Include design calculations.

C. Manufacturer's Literature: Manufacturer's recommended installation instructions.

D. Manufacturer's certificates of material conformance with specifications.

E. Test Reports: Reports of tests on concrete.

F. Testing

1. Manholes and Valve Vaults: Four (4) concrete test cylinders shall be taken for every 50 cubic yards (cu. yds) for each type of precast structure.

2. Pump Stations: Four (4) concrete test cylinders shall be taken for each pump station wet well. Four (4) concrete test cylinders shall be taken for each pump station's top and bottom slabs.

3. Certification: The supplier shall provide the certified results of testing (7 day, 28 day) for the test cylinders stated herein. Random test cylinders may be taken at any time by the ENGINEER at the IWSD's expense.

1.3 INSPECTION

A. The quality of all materials, the process of manufacture, and the finished sections shall be subject to inspection and approval by the ENGINEER, or the IWSD Manager or designee. Such inspection may be made at the place of manufacture, or at the site after delivery, or at both places, and the sections shall be subject to rejection at any time on account of failure to meet any of the Specification requirements; even though sample sections may have been accepted as satisfactory at the place of manufacture. Sections rejected after delivery to the job shall be marked for identification and shall be removed from the job at once. All sections which have been damaged after delivery will be rejected, and if already installed, shall be repaired, if permitted and accepted by ENGINEER, or removed and replaced, entirely at the CONTRACTOR's expense.

B. At the time of inspection, the sections will be carefully examined for compliance with ASTM C478 designation and these Specifications, and with the approved

manufacturer's drawings. All sections shall be inspected for general appearance, dimension, scratch-strength , blisters, cracks, roughness, soundness, etc. The surface shall be dense and close-textured.

C. Imperfections may be repaired, subject to the approval of the ENGINEER, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final approval. Cement mortar used for repairs shall have a minimum compressive strength of 4,000 psi at the end of 7 days and 5,000 psi at the end of 28 days, Epoxy mortar may be utilized for repairs subject to the approval of the ENGINEER.

PART 2 PRODUCTS

2.1 PRECAST CONCRETE WET WELLS AND VALVE VAULTS

A. Precast submersible pump station wet wells shall consist of precast base, precast wet well sections, and top cover slab. Precast valve vaults shall consist of precast base, sidewalls and top slab. Concrete shall be air entrained at the time of delivery and shall have a minimum compressive strength of 4,000 psi at the end of 28 days.

B. Joints between precast concrete sections shall be set by plastic shims and fitted with non-metallic non-shrink grout as shown on the drawings.

C. The top slab sections shall be fitted with watertight hatches. The frames and covers will be sized for the openings shown on the drawings.

D. The various precast sections should have the inside dimensions and minimum thickness of concrete as indicated on the drawings. All precast and cast-in-place concrete members shall conform to the Building Code Requirements for Reinforced Concrete ACI 318.

E. A vent pipe shall be furnished and installed as shown on the drawings.

F. Fillets shall be provided and installed in the wet wells as shown on the drawings.

G. Precast structures shall be constructed to the dimensions as shown on the drawings and as specified in these Specifications.

H. Type II cement shall be used except as otherwise approved.

I. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the inside of each precast section.

J. Sections shall be cured by an approved method and shall not be shipped until the minimum 7-day compressive strength has been attained.

K. Each pre-cast section manufactured in accordance with the drawings shall be clearly marked to indicate the intended pump station installation location. The CONTRACTOR shall be responsible for the installation of the correct pre-cast sections in their designated pump station locations.

L. Paint all exterior surfaces with two coats of coal tar bitumastic, each coat to be 9 mils each. All interior surfaces of valve vaults shall be coated with two coats of coal tar epoxy (9 mils each).

2.2 PRECAST CONCRETE SECTIONS FOR CIRCULAR WET WELLS

A. Wet wells shall meet the requirements of ASTM C478, Specification for Precast Reinforced Concrete Manhole Sections, with the exclusion of Section 10(a), except as modified herein. Cement shall meet the requirements of ASTM C150-74, Specification for Portland Cement, Type II. Concrete shall meet the minimum requirement for 4000 psi concrete. Minimum wall thickness shall be 8 inches or 1/8 the inside manhole diameter as shown, whichever is greater. The required minimum strength of concrete shall be confirmed by making and testing three standard cylinders at seven days. Rings shall be custom made with openings to meet indicated pipe alignment conditions and invert elevations. Submit shop drawings, consisting of manufacturers' standard details of various sections for approval prior to placing order for wet wells. Drawings of individual wet wells showing invert elevations, pipe sizes and similar details will not be required.

B. Joints

Form joint contact surfaces with machined castings. Surfaces shall be exactly parallel with nominal 1/16 inch clearing and the tongue equipped with a proper recess for the installation of an O-ring rubber gasket. Gaskets shall meet the requirements of Specification for Joint for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets. RAM-NEK sealing compound conforming to Federal Specification SSS-00210 (GSA-FSS), Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints may be used in lieu of O-ring rubber gaskets. If joints are sealed with RAM-NEK sealing compound the recess in the tongue for an O-ring gasket may be omitted.

C. Wet Well Liners and Coatings

Coat or line (see internal protection on IWSD Approved Product List, Appendix F) the interior of all wet wells.

Furnish, install, test and inspect liners and coating in accordance with manufacturer's recommendations, and in accordance with Section 099723 "Concrete Coatings". Extend coating and liner and seal onto wet well hatch frame, around pipe openings and other protrusions to prevent contact of wet well surface

with corrosive sewer gases. Provide factory or field applied bituminous or epoxy sealer exterior coatings. If exterior coating is factory applied, CONTRACTOR shall provide field touch-up as required.

D. STEEL REINFORCED POLYMER CONCRETE STRUCTURES

As an alternative to the concrete coatings and linings described above, steel reinforced polymer concrete structures may be furnished and installed for pump station wet wells. All steel reinforced polymer concrete structures shall be supplied by a qualified company with a minimum of 5 years' experience manufacturing polymer concrete. All steel reinforced polymer concrete structures shall be manufactured and installed in accordance with the applicable requirements of ASTM C76, C478, C443, D6783, C33, C267, A82, A165, A496, A497, A615, and A615M.

2.3 PIPE CONNECTIONS AT STRUCTURES

A. Where pipes are to extend into or through structures from the exterior, provide flexible connections (mechanical or push-on type joints) at the exterior wall face.

B. For pipes passing through structural walls, install wall pipes with water stops where the location is below the surface of the ground or at any point where fluid levels will exceed that elevation. Neoprene sleeves with watertight caulking and 316 Series SS stainless steel clamps will be suitable at other locations.

C. All of the following conditions apply to any proposed pipe penetration into an existing sanitary manhole:

1. The opening for the penetration must be core bored and fitted with a neoprene sleeve as specified above.

2. The core boring or penetration shall not affect a structural joint, and the boring edge must be no closer than six inches to an existing structural joint.

3. The proposed piping within the manhole must comply with all other provisions of these Utilities Standards.

4. Connections requiring drop pipes shall be constructed in accordance with these Utilities Standards and shall require two penetrations.

5. The existing manhole flume or invert must be modified as required to accept the discharge from the proposed pipe.

6. The interior lining of the existing structure including flume or invert shall be repaired by an approved applicator for the lining system.

7. Any damage to the exterior coating of the existing structure shall be repaired with two coats of coal tar epoxy (9 mils each) in accordance with the manufacturer's recommendations.

PART 3 EXECUTION

3.1 INSTALLATION

A. Control ground water to provide firm, dry subgrade for the structure, and prevent water rising on new poured in place concrete or grouted joint sections within 24 hours after placing. Guard against flotation or other damage resulting from ground water or flooding.

B. Place a 12-inch layer (minimum thickness) of crushed stone or shell as specified under Section 312323 as a foundation for the wet well base slabs, valve pits, and meter pits.

C. Provide backfill material around the wet well and above the pipe bedding as specified in Section 312323.

D. Precast bases, conforming to all requirements of ASTM C478 and above listed requirements for precast sections, may be used. Set the base in place on a thoroughly compacted crushed stone sub-base and adjust grade for the correct structure elevation.

E. Do not set the station into the excavation until the installation procedure and excavation have been approved by the IWSD Manager or designee.

F. The base may be cast-in-place concrete as specified in Division 3, placed on a thoroughly compacted crushed stone sub-base. Shape the tops of the cast-in-place bases to mate with the precast barrel section, and adjust in grade so that the top slab section is at the approximately correct elevation.

G. Set the precast concrete structure sections so as to be vertical and with sections in true alignment with a 3 inch maximum tolerance to be allowed. Fill the outside and inside joint with a non-shrink grout and finish flush with the adjoining surfaces. Allow joints to set for 24 hours before backfilling. Backfill in a careful manner, bringing the fill up evenly on all sides. If leaks appear in the structures, caulk the inside joints with lead wool to the satisfaction of the ENGINEER. Install the precast sections in a manner that will result in a watertight joint.

H. Plug holes in the concrete sections required for handling or other purposes with a non-shrinking grout or by grout in combination with concrete plugs.

SECTION 09910

MANHOLE LINING SYSTEM

PART 1 GENERAL

1.01 Summary

A. This specification covers labor, materials, equipment and services to install a manhole lining system on existing concrete manholes and wetwells and new precast concrete manholes and wetwells as indicated on the plans.

B. Related sections:

1. Section 01300 – Submittals

1.02 References

A. SSPC SP-13/Nace No. 6 – Surface Preparation of Concrete

B. ASTM – The published standards of the American Society for Testing and Materials, West Conshohocken, PA.

C. NACE – The published standards of National Association of Corrosion Engineers (NACE International) Houston, TX.

D. SSPC – The published standards of the Society of Protective Coatings, Pittsburgh, PA.

1.03 Submittals

A. Product Data

1. Technical data sheet on each product used.

2. Material Safety Data Sheet (MSDS) for each product used.

3. Copies of independent testing performed on the coating product indicating the product meets the requirements as specified herein.

4. Technical data sheet and project specific data for repair materials to be topcoated with the coating product(s) including application, cure time and surface preparation procedures.

B. Contractor Data:

1. Current documentation from coating product manufacturer certifying contractor's training and equipment complies with the Quality assurance requirements specified herein.

2. Five (5) recent references of coating contractor indicating successful application of coating product(s) of the same material type as specified herein, applied by spray application within the municipal wastewater environment.

1.04 Quality Assurance

A. Coating product(s) shall be capable of being installed and curing properly within a manhole environment. Coating product(s) shall be resistant to all forms of chemical or bacteriological attack found in municipal sanitary sewer systems; capable of adhering to the manhole structure substrates.

B. Repair product(s) shall be compatible with coating product(s) including ability to bond to form a composite system.

C. Utilize equipment for the spray application of the coating product(s) which has been approved by the coating product manufacturer; and the equipment operator has received training on the operation and maintenance of said equipment from the coating product manufacturer.

D. Contractor shall be certified by the coating product manufacturer for the handling, mixing, application and inspection of the coating product(s) to be used as specified herein.

E. Inspectors shall be trained in the use of testing or inspection instrumentation and knowledgeable of the proper use, preparation and installation of coating product(s) to be used as specified herein.

F. Provide and enforce quality control procedures consistent with the coating product(s) manufacturer recommendations and applicable NACE or SSPC standards as referenced herein.

1.05 Delivery, Storage, And Handling

A. Materials are to be kept dry, protected from weather and stored under cover.

B. Protective coating materials are to be stored between 50° F and 90° F. Do not store near flame, heat or strong oxidants.

C. Protective coating materials are to be handled according to their material safety data sheets.

1.06 Site Conditions

A. Conform to local, state and federal regulations including those set forth by OSHA, RCRA, and the EPA and other applicable authorities.

B. Provide plans to Engineer for review for confined space entry, flow diversion and/or bypass plans prior to performing the Work.

1.07 Special Warranty

A. Warrant work against defects in materials and workmanship for a period of ten (10) years, unless otherwise noted, from the date of final acceptance of the project. Repair or replace,

within a reasonable time after receipt of written notice, defects in materials or workmanship which may develop during said ten (10) year period and any damage to other work caused by such defects or the repairing of same, at his expense.

PART 2 PRODUCTS

2.01 Existing Products

A. Standard Portland cement or new concrete (not quick setting high strength cement) must be cured a minimum of 28 days prior to application of the coating product(s).

B. Remove existing coatings prior to application of the coating product(s) which may affect the performance and adhesion of the coating product(s).

C. Thoroughly clean and prepare existing products to effect a seal with the coating product(s).

2.02 Repair And Resurfacing Products

A. Repair products shall be used to fill voids, bugholes, and/or smooth transitions between components prior to the installation of the coating product(s). Repair materials must be compatible with the specified coating product(s) and shall be used and applied in accordance with the manufacturer's recommendations.

B. Resurfacing products shall be used to fill large voids, lost mortar in masonry structures, smooth deteriorated surfaces and rebuild severely deteriorated structures.

C. The following products may be accepted and approved as compatible repair and resurfacing products for use within the specifications:

1. 100% solids, solvent-free epoxy grout specifically formulated for polyester resin topcoating compatibility.

2. Factory blended, repair setting, high early strength, fiber reinforced, non-shrink repair mortar that can be toweled or pneumatically spray applied may be acceptable if specifically formulated to be suitable for topcoating with the specified coating product(s).

2.03 Coating Products

A. Manufacturers: Integrated Environmental Technologies, Santa Barbara, California (805) 969-2292.

B. Products: IET – 100% solids, two component, highly modified polyester resin system meeting the following minimum characteristics:

1. No adhesion-interfering shrinkage upon curing.

2. Compressive Strength, psi (ASTM D695): 15,000 (minimum)

3. Tensile Strength, psi (ASTM D638): 4,900 (minimum)

4. Flexural Modulus, psi (ASTM D790): 8,600 (minimum)

5. Impact Resistance (Specimen with Knotch): 10.0 Inch-Pounds

6. Impact Resistance (Specimen without Knotch): 4.5 Inch-Pounds

7. Barcol Hardness (Impressor #L25): 72 (minimum)

8. Adhesive Strength, psi: 1582

9. Chemical Resistance all types of service for:
   a. Municipal sanitary sewer environment
   b. Sulfuric acid, 25%
   c. Hydrogen Sulfide Gas, All concentrations
   d. Sodium hydroxide, 5%

2.04 Coating Application Equipment

A. Spray equipment shall be specifically designed to accurately ratio and apply the coating products and shall be in good working order to create a monolithic seamless lining.

B. Hard to reach areas, primer application and touch-up may be performed using hand tools.

PART 3 EXECUTION

3.01 Examination

A. Comply with local, state and federal regulatory and other applicable agencies with regard to environment, health and safety during work.

B. Structures to be coated shall be readily accessible.

C. New Portland cement concrete structures shall have cured a minimum of 28 days since manufacture prior to commencing coating installation.

D. Any active flows shall be dammed, plugged or diverted as required to ensure all liquids are maintained below or away from the surfaces to be coated.

E. Temperature of the surface to be coated should be maintained between 40° F and 120° F.

F. Shield surfaces to be coated to avoid exposure of direct sunlight or other intense heat source. Where varying surface temperature does exist, schedule coating installation when the temperature is falling versus rising.

G. Prior to commencing surface preparation, inspect surfaces to receive the coating and notify Owner, in writing, of any noticeable disparity in the site, structure or surfaces which may interfere with the work, use of materials or procedures as specified.

3.02 Surface Preparation

A. Oils, grease, incompatible existing coatings, waxes, form release, curing compounds, efflorescence, sealers, salts, or other contaminants which may affect the performance and adhesion of the coating to the substrate shall be removed.

B. Concrete and/or mortar damaged by corrosion, chemical attack or other means of degradation shall be removed so that the only sound substrate remains.

C. Choice of surface preparation method(s) shall be based upon the condition of the structure and concrete or masonry surface, potential contaminants present, access to perform work, and required cleanliness and profile of the prepared surface to receive the coating product(s).

D. Surface preparation method or combination of methods to be used include high pressure water cleaning, high pressure water jetting, abrasive blasting, shotblasting, grinding, scarifying, detergent water cleaning, hot water blasting and others described in NACE no. 6/SSPC SP-13. Whichever method(s) are used, they shall be performed in a manner that provides a uniform, sound clean neutralized surface suitable for topcoating with the coating product(s).

E. Infiltration shall be stopped by using a material which is compatible with the repair products and is suitable for topcoating with the coating product(s).

F. Termination points of the coating product(s) shall be made at the bottom of the manhole frame, and a minimum of 1" interfacing with each pipe penetration. The manhole frame and casting shall not be coated.

3.03 Application Of Repair And Resurfacing Products

A. Areas where rebar has been exposed and is corroded shall be first prepared in accordance with Section 3.02. The exposed rebar shall then be abrasive blasted and coated with coating product specified.

B. Repair products shall be used to fill voids, bugholes, and other surface defects which may affect the performance or adhesion of the coating product(s).

C. Resurfacing products shall be used to repair, smooth or rebuild surfaces with rough profiles to provide a concrete or masonry substrate suitable for the coating product(s) to be applied. These products shall be installed to minimum thickness as recommended within manufacturers published guidelines.

D. Repair and resurfacing products shall be handled, mixed, installed and cured in accordance with manufacturer guidelines.

E. Repaired or resurfaces shall be inspected for cleanliness and suitability to receive the coating product(s). Additional surface preparation may be required prior to coating application.

3.04 Application Of Coating Product(s)

A. Application procedures shall conform to the recommendations of the coating product(s) manufacturer, including environmental controls, product handling, mixing, application equipment and methods.

B. Spray equipment shall be specifically designed to accurately ratio and apply the coating product(s) and shall be in proper working order.

C. Contractors qualified in accordance with Section 1.04 of these specifications shall perform all aspects of coating product(s) installation.

D. Prepared surfaces shall be coated by spray application of the coating product(s) described herein to a minimum wet film thickness of 200 mils.

E. Subsequent topcoating or additional coats of the coating product(s) shall occur within the products recoat window. Additional surface preparation procedures will be required if this recoat window is exceeded.

F. Coating product(s) shall interface with adjoining construction materials throughout the manhole structure to effectively seal and protect concrete or masonry substrates from infiltration and attack by corrosive elements. Procedures and materials to effect this interface shall be as recommended by the coating product(s) manufacturer.

G. Termination points of the coating product(s) shall be made at the bottom of the manhole frame, and a minimum of 1" interfacing with each pipe penetration. The manhole frame and casting shall not be coated.

H. Manhole inverts shall be coated.

I. Sewage flow shall be stopped, bypassed or diverted for application of the coating product(s) to the invert and interface with pipe material.

3.05 Testing And Inspection

A. During application a wet film thickness gauge, meeting ASTM D4414-Standard Practice for Measurement of Wet Film Thickness of Organic Coatings by Notched Gages, shall be used. Take measurements, document and attest to results and submit to Engineer.

B. After the coating product(s) have set in accordance with manufacturer instructions, surfaces shall be inspected for holidays with high voltage holiday detection equipment. Reference NACE RPO 188-99 for performing holiday detection. Detected holidays shall be marked and repaired by abrading the coating surface with grit disk paper or other hand tooling method. After abrading and cleaning, additional coating shall be hand applied to the repair area. Touch-up/repair procedures shall follow the coating manufacturer's recommendations. Documentation on areas tested, results and repairs made shall be provided to the Engineer.

C. Visual inspection shall be made by the Engineer and/or Inspector. Deficiencies in the finished coating shall be marked and repaired according to the specified procedures.

D. Return the sewer system to full operation after final inspection and acceptance of the Work.

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 312319

GROUNDWATER CONTROL FOR OPEN CUT EXCAVATION

PART 1 GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. This section provides for furnishing all permits, labor, materials, equipment, power and incidentals for performing all operations necessary to dewater, depressurize, drain and maintain excavations as described herein and as necessary for installation of pipeline and appurtenances. Included are installing, maintaining, operating and removing dewatering systems and other approved devices for the control of surface and groundwater during the construction of pipelines and appurtenances, open cut excavations, directional drilling. Included also are protecting work against rising waters and repair of any resulting damage.

1.2 CONTRACTOR'S RESPONSIBILITY

A. It is the sole responsibility of the CONTRACTOR to identify groundwater conditions and to provide any and all labor, material, equipment, techniques and methods to lower, control and handle the groundwater as necessary for his construction methods and to monitor the effectiveness of this installed system and its effect on adjacent facilities.

B. Operate, maintain and modify the system(s) as required to conform to these Specifications. Upon completion of the Construction, remove the system(s). The development, drilling and abandonment of all wells used in the dewatering system shall comply with regulations of the Florida Department of Environmental Protection and the governing Water Management District.

C. Assume sole responsibility for dewatering systems and for all loss or damage resulting from partial or complete failure of protective measures and any settlement or resultant damage caused by the dewatering operation.

1.3 PLANS AND OTHER DATA TO BE SUBMITTED

A. Prior to commencement of work, submit complete drawings, details and layouts showing the proposed dewatering plans in sufficient detail (i.e., general arrangements, procedures to be used, etc.) so as to allow the ENGINEER to evaluate the proposed dewatering systems. Include the following, as required by the CONTRACTOR's proposed operation:

1. Names of equipment suppliers.

2. Names of installation subcontractors.

3. Plan for dewatering at access shafts and control of surface drainage.

4. Plan for dewatering for cut-and-cover excavations, or otherwise controlling groundwater.

5. Eductor system layout and details.

6. Deep well locations and details.

7. Well point system layout and details.

8. Installation reports for eductors, deep wells and well points.

9. Water level readings from piezometers or observation wells, and method of maintenance.

10. As part of his request for approval of a dewatering system, demonstrate the adequacy of the proposed system and well point filler sand by means of a test installation.

PART 2 PRODUCTS

A. Select equipment including but not limited to pumps, eductors, well points and piping and other material desired.

PART 3 EXECUTION

3.1 DEWATERING EXCAVATIONS

A. Obtain all permits necessary for dewatering operations and file a copy of all such permits with the County Manager or designee and ENGINEER.

B. Furnish, install, operate and maintain all necessary equipment for dewatering the various parts of the Work and for maintaining free of water the excavations and such other parts of the Work as required for Construction operations. Dewatering system should provide for continuous operation including nights, weekends, holidays, etc. Provide appropriate backup if electrical power is primary energy source for dewatering system.

C. Continue dewatering in all required areas, until the involved work is completed, including the placing and compaction of backfill materials.

D. Provide a uniform diameter for each pipe drain run constructed for dewatering. Remove the pipe drain when it has served its purpose. If removal of the pipe is impractical, provide grout connections at 50-foot intervals, and fill the pipe with clay grout or cement and sand grout when the pipe has served its purpose.

3.2 DEWATERING TRENCH

A. Dewatering Excavation Plan: Develop an excavation dewatering plan that considers site ground and groundwater conditions, the type and arrangement of the equipment to be used and the proper method of groundwater disposal. Prepare the dewatering plan before beginning excavations below groundwater. Maintain one copy of the dewatering plan at the project site to be available for inspection while all dewatering operations are underway.

B. Do not lay any pipeline in a trench in the presence of water. Remove all water from the trench sufficiently ahead of the pipeline placing operation. The ENGINEER shall have full and final authority to require dewatering of the trench to ensure a dry, firm bed on which to place the pipeline. As a minimum, maintain water levels at least 6 inches below the bottom of the trench. Continue to dewater trench until trench backfilling operations have been completed.

1. If a dry trench bottom has not been obtained with usual methods of trench dewatering, then the order to excavate below grade and place sufficient select fill material, crushed stone, or 2500 psi concrete over the trench bottom may be given.

2. If all efforts fail to obtain a stable dry trench bottom, and it is determined that the trench bottom is unsuitable for pipe foundation, present an alternate system for stabilization to the Engineer of Record for approval by the County Manager or designee on a case-by-case basis.

C. Removal of water may be accomplished by pumping in connection with well point installation as the particular situation may warrant.

D. If the soils encountered at the trench grade are suitable for the passage of water, without destroying the sides or utility foundation of the trench, sumps may be provided at intervals at the side of the main trench excavation. Use pumps to lower the water level by taking their suction from said sumps.

3.3 REQUIREMENTS FOR EDUCTOR, WELL POINTS OR DEEP WELLS

A. Eductor, well points or deep wells, where used, must be furnished, installed and operated by a reputable CONTRACTOR regularly engaged in this business, and approved.

3.4 DURATION OF DRAINAGE

A. In areas where concrete is to be placed, carry out the foundation drainage so that the required lowering of the water table will be effected prior to placing reinforcing steel. Keep foundation beds free from water to the same levels for 3 days after placing concrete.

3.5 PROTECTION OF STRUCTURES

A. Provide adequate protection for all structures to avoid damage to concrete.

B. Operate construction equipment over completed concrete slabs or structures only with approval. Rubber tire equipment heavier than 5 tons and crawlers heavier than 7 tons will require adequate load spreading by sand fill or other means.

3.6 DISCHARGE OF WATER

A. Do not discharge pumped drainage water into the sanitary sewer system or inhibit pedestrian or vehicular traffic with the groundwater control system.

B. Discharge pumped drainage water into the storm sewer system or drainage ditch by direct means (i.e., discharge hose to inlet, burying header, etc.). Monitor the discharged water to determine that soil particles are not being removed.

C. Conform all discharge to current South Florida Water Management District and Collier County Department of Stormwater Management rules, regulations, procedures and regulatory permits and if discharged into receiving waters, shall not exceed 29 N.T.U.'s above background.

3.7 REPAIR OF DAMAGE

A. Assume full responsibility for all loss and damage due to flooding, rising water or seepage resulting from dewatering operations in any part of the work. Repair any damage to partially completed work from these or other causes, including the removal of slides, repair of foundation beds and performance of any other work necessitated by lack of adequate dewatering or drainage facilities.

END OF SECTION

SECTION 330518

LAYING AND JOINTING BURIED PIPELINES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Installation of all underground pipelines. Provide pipeline materials, coatings and linings as specified and pipe of the types, sizes and classes shown or specified.

1. Use proper and suitable tools and appliances for the safe and convenient cutting, handling, and laying of the pipe and fittings.

2. Use suitable fittings where shown and at connections or where grade or alignment changes require offsets greater than those recommended and approved.

3. Lay all underground pipelines not supported on piles or concrete cradle in select fill bedding material.

4. Close off all lines with bulkheads when pipe laying is not in progress.

B. Related Work Specified in Other Sections Includes:

1. Section 022501 – Leakage Tests

2. Section 025400 – Disinfection

3. Section 312316 – Excavation - Earth and Rock

4. Section 312319 – Groundwater Control for Open Excavation

5. Section 312323 – Backfilling

6. Section 330502 – High Density Polyethylene (HDPE) Pipe and Fittings

7. Section 330503 - Polyvinyl Chloride (PVC) Pipe and Fittings

8. Section 330504 - Ductile Iron Pipe (DIP) and Fittings

1.2 REFERENCES

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

1. ASTM D 2774 - Practice for Underground Installation of Thermoplastic Pressure Piping

2. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances

3. ASTM A 307 - Specification for Carbon Steel Bolts and Studs, 60000 psi Tensile

4. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, C25, 125, 250, 800

5. ASME B16.21 - Nonmetallic Flat Gaskets for Pipe Flanges

6. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

7. AWWA C115/A21.15 - Flanged Ductile-Iron Pipe With Threaded Flanges

8. Uni-Bell - Handbook of PVC Pipe

9. Collier County - Utilities Standards and Procedures Ordinance

1.3 DELIVERY, STORAGE AND HANDLING

A. General: Deliver, store and handle all products and materials as specified in Division 1 and as follows:

B. Transportation and Delivery: Take every precaution to prevent injury to the pipe during transportation and delivery to the site.

C. Loading and Unloading: Take extreme care in loading and unloading the pipe and fittings.

1. Work slowly with skids or suitable power equipment, and keep pipe under perfect control at all times.

2. Under no condition is the pipe to be dropped, bumped, dragged, pushed, or moved in any way that will cause damage to the pipe or coating.

D. Sling: When handling the pipe with a crane, use a suitable sling around the pipe.

1. Under no condition pass the sling through the pipe. Interior of pipe is to be kept free of dirt and foreign matter at all times.

2. Use a nylon canvas type sling or other material designed to prevent damage to the pipe and coating.

3. When handling reinforced concrete pipe or uncoated steel or ductile iron pipe, steel cables, chain or like slings are acceptable.

E. Damaged Piping: If in the process of transportation, handling, or laying, any pipe or fitting is damaged, replace or repair such pipe or pipes.

F. Blocking and Stakes: Provide suitable blocking and stakes installed to prevent pipe from rolling.

1. Obtain approval for the type of blocking and stakes, and the method of installation.

G. Storage for Gaskets: Store gaskets for pipe joints in a cool place and protect gaskets from light, sunlight, heat, oil, or grease until installed. Store gaskets in a sealed container (such as a vented drum). When long-term storage with exposure to direct sunlight is unavoidable, PVC pipe should be covered with an opaque material while permitting adequate air circulation above and around the pipe as required to prevent excessive heat accumulation (Uni-Bell PVC Handbook).

1. Do not use any gaskets showing signs of cracking, weathering or other deterioration.

2. Do not use gasket material stored in excess of six months without approval.

1.4 FIELD CONDITIONS

A. Repair of Sanitary Sewers and Services: Rebed, in compacted select fill material, sanitary sewers which cross over the new pipe or which cross under the new pipe with less than 12 inches clear vertical separation. Compact the bedding to densities required for new pipeline construction and extend bedding below the sewer to undisturbed earth. Reconstruct sewers damaged by pipeline construction.

1. Furnish and install all materials and do all work necessary for the reconstruction or repairs of sanitary sewers and services.

2. Provide pipe for reconstruction of sanitary sewers and services meeting the appropriate specification requirements.

3. Provide pipe of the same size as the existing sewer or when the same size is not available, use the next larger size of pipe. Obtain approval of joints made between new pipe and existing pipe.

PART 2 PRODUCTS

A. The materials allowed for buried sewer pipes are PVC, HDPE or Ductile Iron Pipe.

PART 3 EXECUTION

3.1 PREPARATION

A. Dry Trench Bottoms: Lay pipe only in dry trenches having a stable bottom.

1. Where groundwater is encountered, make every effort to obtain a dry trench bottom in accordance with Section 312319.

2. Perform trench excavation and backfill in accordance with Sections 312316 and 312323.

3.2 INSTALLATION

A. General: Install all piping in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1. Where pipe joint deflections are used, do not exceed 80 percent of the maximum deflection limits shown in AWWA C600. Gravity systems shall contain no joint deflection.

1. Arrange miscellaneous pipelines, which are shown in diagram form on the Plans, clear of other pipelines and equipment.

2. Gravity systems shall not contain vertical dips greater than one and a half inches (1.5”).

B. Code Requirements: Provide pipeline installations complying with AWWA C600 for iron pipe, AWWA Manual M11 for steel pipe, ASTM D 2774 for thermoplastic pressure piping, and as modified or supplemented by the Specifications.

C. Pipe Laying - General:

1. Thoroughly inspect all pipe for damage and cleanliness. If found to be defective, tag, remove and replace pipe with satisfactory pipe or fittings at no additional charge to COUNTY.

2. Generally, lay all pipe with bells pointing ahead.

3. Carefully place all pipe, pipe fittings, valves and hydrants into trench by means of a derrick, ropes or other suitable tools or equipment in such a manner as to prevent damage and check for alignment and grade.

4. Make adjustments to bring pipe to line and grade by scraping away or filling in select fill material under the body of the pipe.

5. Wedging or blocking up the pipe barrel is not permitted.

6. Bring the faces of the spigot ends and the bells of pipes into fair contact and firmly and completely shove the pipe home.

7. As the work progresses, clean the interior of pipelines of all dirt and superfluous materials of every description.

8. Keep all lines absolutely clean during construction.

9. Lay pipelines accurately to line and grade.

10. During suspension of work for any reason at any time, a suitable stopper shall be placed in the end of the pipe last laid to prevent mud or other material from entering the pipe.

D. Pipe Laying - Trenches:

1. Carefully lay all pipelines in trench excavations piece by piece using suitable tools or equipment on select fill bedding (refer to Utilities Standards and Procedures Ordinance, Section 9.1.2), concrete cradle or other foundations as shown, specified or ordered in writing. Prevent damage to materials, protective coatings and linings.

2. Do not dump or drop pipe or pipe materials into trench.

3. Properly secure the pipe against movement and make the pipe joints in the excavation as required.

4. Carefully grade and compact pipe bedding.

5. Bell Holes:

   a. Cut out bell holes for each joint as required to permit the joint to be properly made and allow the barrel of the pipe to have full bearing throughout its length.

   b. Thoroughly tamp bell holes full of select fill material following the making of each joint to provide adequate support to the pipe throughout its entire length.

E. Other Foundations: Install pipelines laid on other types of foundations as specified for such other foundations or as ordered in writing.

F. Field Cuts of Pipelines: For shorter than standard pipe lengths, make field cuts in a manner producing a cut square and perpendicular to the pipe axis. Remove any sharp, rough edges which otherwise might injure the gasket.

G. Procedure for sealing cut ends and repairing field damaged areas of polyethylene lined pipe and fittings is as follows:

1. Remove burrs caused by field cutting of ends or handling damage and smooth out edge of polyethylene lining if made rough by field cutting or handling damage.

2. Remove oil or lubricant used during field cutting operations.

3. Areas of loose lining associated with field cutting operation must be removed and exposed metal cleaned by sanding or scraping. For larger areas, remove loose lining and dirt, then roughen bare pipe surface by scratching or gouging with a small chisel to provide an anchor pattern for the epoxy. It is recommended that the polyethylene lining be stripped back by chiseling, cutting, or scraping about 1 inch to 2 inches into well adhered lined area before patching. This ensures that all areas of undercutting have been removed. Be sure to roughen an overlap of 1 inch to 2 inches of polyethylene lining in area to be epoxy coated. This roughening should be done with a rough grade emery paper (40 grit), rasp, or small chisel. Avoid honing, buffing, or wire brushing since these tend to make surface to be repaired too smooth for good adhesion.

4. With area to be sealed or repaired clean and suitably roughened, apply a thick coat of a two-part coal tar epoxy (see IWSD Approved Product List, Appendix F). The heavy coat of epoxy must be worked into the scratched surface by brushing. Mixing and application procedure for the epoxy must follow the epoxy manufacturer's instructions.

5. It is important that the entire freshly cut, exposed metal surface of the cut pipe be coated. To ensure proper sealing, overlap at least 1 inch of the roughened polyethylene lining with this two-part epoxy system.

H. Ductile Iron Pipe Mechanical Joints:

1. Assembly: In making up mechanical joints, center the spigot in the bell.

   a. With a wire brush just prior to assembly of the joint thoroughly brush 8 inches outside of spigot and inside of bell with which the rubber gasket comes in contact. Remove all oil, grit, tar (other than standard coating) and other foreign matter from joint.

   b. Brush lubricant over the gasket just prior to installation. (Note: There is only one rubber gasket size for each diameter of pipe.)

   c. Press the gasket into place within the bell and move the gland into position, bolts inserted, and the nuts tightened finger tight.

   d. Tighten the nuts with a torque wrench so that the gland is brought up toward the pipe evenly. Torque wrenches shall be set as specified in AWWA C111. Spanner type wrenches not longer than specified in

AWWA C111 may be used with the permission of County Manager or designee.

e. Tighten all nuts 180 degrees apart alternately in order to produce equal pressure on all parts of the gland.

2. Torques: Apply the following range of bolt torques:

Size Inches	Range of Torque - ft. lbs
5/8	40 - 60
3/4	60 - 90
1	70 - 100
1-1/4	90 - 120

3. Remaking of Joints: If effective sealing is not obtained at the maximum torque listed above, disassemble and reassemble the joint after thorough cleaning.

I. Ductile Iron Pipe Rubber Gasket Joints:

1. Assembly: In making up the rubber gasket joint, brush the gasket seat in the socket thoroughly with a wire brush and wipe the gasket with a cloth.

a. Place the gasket in the socket with the large round end entering first so that the groove fits over the bead in the seat.

b. Apply a thin film of lubricant (AWWA C600) to the inside surface of the gasket that will come in contact with the entering pipe.

c. Brush the plain end of the pipe to be entered thoroughly with a wire brush and place it in alignment with the bell of the pipe to which it is to be joined.

d. Exert sufficient force on the entering pipe so that its plain end is moved past the gasket until it makes contact with the base of the socket to make the joint.

2. Positioning: Before proceeding with backfilling, feel completely around the joint using a feeler gauge to confirm that the gasket is in its proper position.

a. If the gasket can be felt out of position, withdraw the pipe and examine the gasket for cuts or breaks.

b. If the gasket has been damaged, replace it with a new one before re-installing the pipe.

3. Optional Mechanical Joints: Use mechanical joint fittings that meet the requirements of Section 330504 with the rubber gasket joint pipe when specified or when rubber gasket fittings are not available.

J. Temporary Bulkheads: Provide temporary bulkheads at the ends of sections where adjoining pipelines have not been completed, and in connections built into pipelines where adjoining pipelines or structures have not been completed and are not ready to be connected.

1. Remove bulkheads encountered in connecting sewers or structures included in this Contract, or in pipelines or structures previously built, when they are no longer needed or when ordered.

K. Temporary Blow-Off Assembly: Dead-end water lines shall be temporarily ended with a blow-off as shown in IWSD Standard Details. After full bore flush replace with a fire hydrant meeting the requirements of Section 331619.

L. Sleeve Type Couplings: For sleeve type couplings, equally tighten diametrically opposite bolts on the connection so that the gaskets will be brought up evenly all around the pipe.

1. Torque Wrenches: Do the final tightening with torque wrenches set for the torque recommended by the coupling manufacturer.

M. Concrete Encasement: Concrete encasement shall be constructed in accordance with IWSD Standard Details when:

1. A potable water main crosses at a depth that provides less than 18 inches clear distance from sewer lines in which case a Deviation Form request should be completed. Encase the sewer main unless specifically approved by Collier County Utilities. Encasement shall extend a minimum 10 feet on each side of the point of crossing. Pressure test both pipelines to 150 psi after the concrete has properly cured.

2. A water main running parallel to a sewer line provides less than 10 feet separation from sewer lines, in which case a Deviation Form Request needs to be completed. Encase the sewer main unless specifically approved by Collier County Utilities.

3. The ENGINEER has ordered the line encased. NO POTABLE WATER MAIN SHALL BE ENCASED IN CONCRETE UNLESS SPECIFICALLY AUTHORIZED BY THE COUNTY MANAGER OR DESIGNEE.

The points of beginning and ending of pipe encasement shall be not more than 6 inches from a pipe joint to protect the pipe from cracking due to uneven settlement of its foundation or the effects of superimposed live loads.

N. Valve Box Setting: Install valve boxes vertical and concentric with the valve stem.

1. Adjust valve-box to final grade at the time designated by the County Manager or designee.

2. Build a collar, as shown in the standard details, 18 inches by 18 inches by 6 inches or 24 inch diameter round by 6 inches flush to grade of top of box. Similar collar shall be poured flush with grade and top of unpaved areas.

3. Satisfactorily reset any valve box that is moved from its original position, preventing the operation of the valve.

4. Replace any valve box that has been damaged.

O. Identification:

1. Metallized Warning Tape: For DIP and PVC pipe (other than gravity sewer pipe and laterals) to be installed, 3-inch detectable marking tape, of appropriate color and appropriate warning statement, shall be placed along the entire pipe length. In all cases, marking tape shall be installed two feet (2') below grade or one-half the pipe's bury, whichever is less, during backfill operations (refer to Utilities Standards Manual Section 1 – 1.1 and 2.2.1). All PVC pipe, PVC fittings, and identification tape shall be color-coded per Collier County Standards. HDPE pipe installed by horizontal directional drilling will not be required to be marked with metalized warning tape.

2. Electronic Markers (see IWSD Approved Product List, Appendix F): Install electronic markers twenty-four inches (24") below final grade, above pipe, at all bends or changes in alignment and every two hundred and fifty feet (250') along the pipe between bends.

P. Separation From Other Pipe Systems:

1. Parallel Water and Sewer or Non-Potable Lines: Sanitary sewer lines, storm sewers or force mains shall be separated from water mains by a minimum clear vertical distance of 18 inches and a horizontal distance of 10 feet. Non-potable, reclaimed or reuse water mains shall be separated from water mains, gravity sewers or force mains by a minimum clear vertical distance of 18 inches and a horizontal distance of 5 feet center to center or 3 feet outside to outside. When this standard cannot be maintained, the sewer line shall be concrete encased for a distance of 10 feet each way from the water line and any other conduit, with a minimum vertical clearance of 12 inches being provided at all times. See Section 1 - Design Criteria, Subsection 1.2.3.

2. Crossing Water and Sewer or Non-Potable Lines: Water mains crossing over a sewer or non-potable water line shall be (bottom of water main to top of sewer) separated by at least 18 inches unless local conditions or barriers

prevent an 18 inch vertical separation. All crossings with vertical clearance less than 18 inches shall be made using sewer pipe thickness Class 200 AWWA C900 PVC pipe, and water pipe of Class 51 Ductile iron pipe, for a distance of 10 feet on each side of the crossing. The gravity sewer pipe in these locations shall be backfilled with USCS Class I bedding stone to a height of 6 inches above the crown of the pipe. When water mains cross under a sewer, both mains shall be constructed of C900 Class 200 PVC pipe with joints equivalent to water main standards for a distance of 10 feet on each side of the point of crossing with no intermediate joints. Additionally, a section of water main pipe shall be centered at the point of crossing. See Section 1 – Design Criteria, Subsection 1.3.

Q. Aerial Crossings:

1. Pipes spanning elevated pier crossings shall be flanged ductile iron Pressure Class 350 pipe conforming to AWWA C115, C150 & C151. Pipe spanning on piers spaced further apart than normal pipe length of 18 or 20 ft. shall be multiple length pipe with interior flanged joints with a rubber gasket pipe (see IWSD Approved Product List, Appendix F). The pipe wall thickness and flanged joints shall be designed to safely span the elevated piers under working pressure without exceeding the allowable stresses and conform to AWWA C150. Limit pipe deflection at center of span with pipe full of water to 1/720 of span length. Provide expansion joints for between above ground and below ground wastewater lines.

2. Flanges shall conform to AWWA C150 and C115. All bolts and nuts used in aerial crossings shall be 304 stainless steel. Gaskets shall be full faced or recessed O-Ring type to prevent leaks in pipe under stress in the aerial crossing.

3. Outside surface of all pipe, flanges or spool pieces shall be shop coated with zinc primer, High Build Epoxy protective coat and a finish coat of polyurethane high gloss. Color shall be Federal Safety Blue for potable water mains and Pantone Purple 522 C for non-potable irrigation water mains.

4. Install operating valves or other flow regulating devices on each shoreline or at a safe distance from each shoreline to prevent discharge in the event the line is damaged.

5. Install supports for all joints in pipes utilized for aerial crossings and to prevent overturning and settlement. Expansion jointing is specified between above ground and below ground sewers and force mains.

3.3 FIELD QUALITY CONTROL

A. Testing: Test pipelines in accordance with Section 022501.

1. Test valves in place, as far as practicable, and correct any defects in valves or connections.

2. Gravity Sewer Lines: Test in accordance with Section 022501

B. Inspection: Clean, inspect, and examine each piece of pipe and each fitting and special for defects before it is installed.

1. Cut away any lumps or projections on the face of the spigot end or the shoulder.

2. Do not use any cracked, broken, or defective pieces in the work.

3. If any defective piece should be discovered after having been installed, remove and replace this piece with a sound piece in a satisfactory manner at no increase in Contract Amount.

3.4 CLEANING

A. General: Thoroughly clean all pipe before it is laid and keep it clean until it is accepted in the completed work.

B. Removal of Materials: Exercise special care to avoid leaving bits of wood, dirt, and other foreign particles in the pipe. If any particles are discovered before the final acceptance of the work, remove and clean the pipe.

3.5 DISINFECTION

A. General: Disinfect all pipelines that are to carry potable water in accordance with Section 025400.

END OF SECTION

SECTION 099723

CONCRETE COATINGS

PART 1 SEWPERCOAT LINING SYSTEM / IET COATING SYSTEM / RAVEN 405 LINING SYSTEM

1.1 SCOPE OF WORK

A. This section provides details for furnishing and installing the SewperCoat lining system where shown on the drawings for protection of concrete structures against hydrogen sulfide corrosion. Perform installation by workers experienced in the application of the lining system to be used.

B. This section provides details for furnishing and installing the Integrated Environmental Technologies (IET) coating system where shown on the drawings for protection of concrete structures against hydrogen sulfide corrosion. Perform installation by workers experienced in the application of the coating to be used.

C. This section provides details for furnishing and installing the Raven 405 coating system where shown on the drawings for protection of concrete structures against hydrogen sulfide corrosion. Perform installation by workers experienced in the application of the coating system to be used.

D. For sanitary sewer wet wells and manholes, steel reinforced polymer concrete structures may be provided in lieu of concrete coatings and linings as described in this section. See Sections 034100 and 333913 for further details and requirements.

PART 2 PRODUCTS

2.1 SEWPERCOAT LINING SYSTEM

A. The SewperCoat (calcium aluminate) lining system shall be as manufactured by Lafarge Calcium Aluminates, Chesapeake, VA.

B. Pure-fused Calcium Aluminate Cement Lining: The cement lining material shall be a pure fused calcium aluminate mortar with pure fused calcium aluminate aggregate equal to SewperCoat as manufactured by Lafarge Calcium Aluminates, Inc. The material shall be spray applied in accordance with the manufacturer's specifications.

1. The material shall be packaged from the manufacturer so as not to require field mixing of mortar and aggregate to obtain recommended composition.

2. The material shall form a mechanical and chemical bond to the wetwell surface with zero shrinkage. The material shall have a minimum 28-day compressive strength of 9000 psi.

3. The material shall be suitable for use in a severe hydrogen sulfide (H_2S) environment.

4. Provide documentation that the material has a minimum 5-year history in the reconstruction of sanitary sewer structures.

2.2 IET COATING SYSTEM

A. The IET Coating System shall be as manufactured by Integrated Environmental Technologies, Santa Barbara, CA.

B. Polymorphic Resin shall be a 100% solids, two-component, highly modified polyester resin system, exhibiting no adhesion-interfering shrinkage upon curing. Resin shall cure rapidly within fifteen minutes to one hour without the use of heat or cooling at surface temperatures ranging from –30 degrees Fahrenheit to over +150 degrees. Excellent resistance to a broad range of corrosive chemicals, including sulfuric acid created by hydrogen sulfide gas as well as other chemicals typically found in sanitary sewers, and impact and abrasion attack shall be provided.

2.3 RAVEN 405 COATING SYSTEM

A. The RAVEN 405 coating system shall be as manufactured by Raven Lining Systems, Broken Arrow, OK.

B. Raven 405 coating shall be 100% solids, solvent-free ultra high-build epoxy system exhibiting the following characteristics:

1. Product Type: amine cured epoxy

2. VOC Content (ASTM D2584): 0%

3. Compressive Strength, (ASTM D695): 18,000 psi

4. Tensile Strength, (ASTM D638): 7,600 psi

5. Flexural Modulus, (ASTM D790): 700,000 psi

6. Adhesion to Concrete, (ASTM D4541/7234): >200 psi with substrate (concrete) failure

7. Chemical Resistance (ASTM D543/G20) immersion service for:

a. Municipal sanitary sewer environment

b. Sulfuric Acid, 30%

c. Sodium Hydroxide, 10%

d. Sodium Hypochlorite, 3%

8. Successful Pass: Sanitation District of L.A. County Coating Evaluation Study and SSPWC 210.2.3.3 (Greenbook "Pickle Jar" Chemical Resistance test)

2.4 STEEL REINFORCED POLYMER CONCRETE STRUCTURES

A. As an alternative to the concrete coatings and linings described above, steel reinforced polymer concrete structures may be furnished and installed. All steel reinforced polymer concrete structures shall be supplied by a qualified company with a minimum of 5 years' experience manufacturing polymer concrete.

B. All steel reinforced polymer concrete structures shall be manufactured and installed in accordance with the applicable requirements of ASTM C76, C478, C443, D6783, C33, C267, A82, A165, A496, A497, A615, and A615M.

C. Approved manufacturers: See County Approved Product List, Appendix F.

PART 3 EXECUTION

3.1 SEWPERCOAT LINING

A. Plug or bypass all pipes in service before any work is started on the structure. No debris is to be flushed down the line.

B. Anyone entering the structure must conform to all OSHA requirements for "Confined Space Entry" equipment and permitting.

C. Prepare surface in accordance with the requirements of SewperCoat Data Sheets on Concrete Preparation. Interior surfaces of wetwell shall be sound, porous, dry, and free of dust, dirt, oil, grease and other contaminants prior to application of lining.

D. Interior surface of structure must be abrasive-blasted to remove all loose patching, old coatings and any contamination in the concrete. Do not use silica sand.

1. Abrasive-blast "new" structures to remove all oils and patch mud, and to open pinholes and expose aggregate.

2. Abrasive-blast "rehab" structures to remove all loose patching, old coatings, and any contamination that penetrated the concrete. The finished interior of the structure shall be gray. Coat the exposed invert/floor also. Where there is severe deterioration of the mortar, place new concrete to match the original interior dimensions after abrasive blasting and removal of all loose material and by-products of corrosion. Restore invert/floor to the original elevation.

3. Vacuum to remove all abrasives and debris.

4. Condition of the wetwell may require the use of a 10% solution of hydrochloric (muriatic) acid over all surfaces or the use of a detergent. If an acid or detergent solution is used, the surface shall be thoroughly rinsed and neutralized prior to the installation of the liner system.

E. Repair all leaks by injecting grout using Avanti Multi-grout AV-202 or equivalent. Hydraulic cement shall not be used to stop any water leaks.

F. Spray Application: Mix and apply the pure fused calcium aluminate cement liner system in strict accordance with the manufacturer's written instructions using only manufacturers approved equipment. This includes the preparation, installation, curing and finish operation required for the completion of the process.

1. Wet gun: Spray the material directly to the damp wetwell surface in a two-coat application. Trowel the material smooth after each coat, completely covering the interior surface of the wetwell from the frame to the invert with a minimum thickness of 1 inch. Apply a "brushed" finish to the second coat after troweling.

2. Dry Gun: Spray the material directly to the damp wetwell surface in a one-coat application. Trowel the material smooth after the application, completely covering the interior surface of the wetwell from the frame to the invert with a minimum thickness of 1 inch. Apply a "brushed" finish after troweling.

G. Curing: The material shall cure in strict accordance with the manufacturer's recommendations and instructions.

H. Inspect lining system for holidays (i.e., discontinuity), cracks and pinholes. Take particular care to check lining over brick, block, heavy spalled surfaces, and other very rough surfaces and locate holes in the lining caused by voids in bricks, block, concrete and structure joints. Fill voids and holidays in accordance with the lining system manufacturer's instructions.

I. Provide a five (5) year unlimited warranty on all workmanship and products. The work includes the surface preparation and application of the SewperCoat lining system, and shall protect the structure for at least five (5) years from all leaks, and from failure due to corrosion from exposure to corrosive gases such as hydrogen sulfide.

3.2 IET COATING

A. Plug or bypass all pipes in service before any work is started on the structure. No debris is to be flushed down the line.

B. Anyone entering the structure must conform to all OSHA requirements for "Confined Space Entry" equipment and permitting.

C. Prepare surface in accordance with the requirements of IET Systems Data Sheets on Concrete Preparation. Interior surfaces of manhole shall be sound, porous, dry, and free of dust, dirt, oil, grease and other contaminants prior to application of lining.

D. Dry abrasive-blast Interior surface of structure to remove all loose patching, old coatings and any contamination in the concrete. Do not use silica sand.

1. Dry abrasive-blast "new" structures to remove all oils and patch mud, and to open pin holes and expose aggregate.

2. Dry abrasive-blast "rehab" structures to remove all loose patching, old coatings, and any contamination that penetrated the concrete. The finished interior of the structure shall be gray. Coat the exposed invert/floor also. Where there is severe deterioration of the mortar, place new concrete to match the original interior dimensions after abrasive blasting and removal of all loose material and by-products of corrosion. Restore invert/floor to the original elevation.

3. Vacuum to remove all abrasives and debris.

E. Repair all leaks by injecting grout using Avanti Multi-grout AV-202 or equivalent. Hydraulic cement shall not be used to stop any water leaks.

F. Clean and remove dust material with pressure washing for maximum adhesion. Blow dry concrete at 250 cfm with 120 psi.

G. Apply IET Systems Coating by the use of the IET Systems Spray Unit and IET Systems Spincaster. Apply IET coating at least three different intervals – prime coat, intermediate coat and finish coat, per IET Systems manufacturer instructions and specifications. The total thickness of the IET coating shall be at least 125 mils.

H. Inspect lining system for holidays, cracks and pinholes. Take particular care to check lining over brick, block, heavy spalled surfaces, and other very rough surfaces and locate holes in the lining caused by voids in bricks, block, concrete and structure joints. Fill voids and holidays in accordance with the lining system manufacturer's instructions.

I. Provide a five (5) year unlimited warranty on all workmanship and products. The work includes the surface preparation and application of the IET coating system, and shall protect the structure for at least five (5) years from all leaks, and from failure due to corrosion from exposure to corrosive gases such as hydrogen sulfide.

3.3 RAVEN 405 COATING

A. Plug or bypass all pipes in service before any work is started on the structure. No debris is to be flushed down the line.

B. Anyone entering the structure must conform to all OSHA requirements for "Confined Space Entry" equipment and permitting.

C. Prepare surface in accordance with the requirements of Raven Data Sheets on Concrete Preparation. Interior surfaces of structure shall be sound, porous, dry, and free of dust, dirt, oil, grease and other contaminants prior to application of lining.

D. Dry abrasive-blast Interior surface of structure to remove all loose patching, old coatings and any contamination in the concrete. Do not use silica sand.

1. Dry abrasive-blast “new” structures to remove all oils and patch mud, and to open pin holes and expose aggregate.

2. Dry abrasive-blast “rehab” structures to remove all loose patching, old coatings, and any contamination that penetrated the concrete.

3. Vacuum to remove all abrasives and debris.

E. New Portland concrete structures shall have a minimum of 28 days cure since manufacture prior to commencing coating installation.

F. Offset structural components, lids, covers, frames, etc. shall be repaired, replaced, or reset prior to the commencement of surface preparation.

G. Concrete and/or mortar damaged by corrosion, chemical attack or other means of degradation shall be removed so that sound substrate remains.

H. In conditions where severe chemical/microbiological attack is present the prepared substrate shall exhibit a pH of 8-12. Additional cleaning and/or contaminated substrate removal may be required to achieve the specified pH level.

1. Prior to the application of the coating product repairs shall be completed to ensure the following:

2. All inflow and infiltration shall be eliminated by use of appropriate repair material(s), such as hydraulic cements and/or chemical grouts as described in Section 2.2.

3. All repairs to joints, pipe seals, steps, mechanical penetrations, benches, inverts, pipes or other appurtenances to be coated shall be completed and repaired surfaces prepared according to this section.

4. Benches or other horizontal surfaces shall have adequate slope (1” rise per lineal foot minimum) to minimize the retention of debris following surcharge.

5. Inverts or flow channels shall be smooth without lips, rough edges or other features which may cause debris to collect; contoured to minimize turbulent flow; and be sloped to promote adequate flow from the inlet(s) to the outlet pipe.

6. All joints, pipe seals, steps or other penetrations shall be sealed against inflow, infiltration and exfiltration and be adequately filled, smoothed and contoured to promote monolithic coating application.

I. Areas where reinforcing steel has been exposed shall be repaired in accordance with the Project Engineer's recommendations or at the minimum all exposed steel shall be prepared in accordance with Section 3.2 prior to coating with the coating product specified or other approved primer as specified by the coating product manufacturer.

J. Coating shall be applied to a minimum dry film thickness of 80 mils to surface profiles of CSP-4 to CSP-5 or 125 mils minimum DFT to surface profiles of CSP-6 or greater and in rehabilitated structures.

K. Subsequent top coating or additional coats of the coating product(s) shall occur within the products recoat window. Additional surface preparation procedures will be required if this recoat window is exceeded.

L. Provide a five (5) year unlimited warranty on all workmanship and products. The work includes the surface preparation and application of the Raven 405t lining system, and shall protect the structure for at least five (5) years from all leaks, and from failure due to corrosion from exposure to corrosive gases such as hydrogen sulfide.

END OF SECTION

SECTION 333913

SEWER MANHOLES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Requirements for providing sewer manholes and all other appurtenances for a complete installation. Provide precast reinforced concrete manholes conforming to ASTM C478 in accordance with the Collier County Standard Details.

B. Related Work Specified in Other Sections Include:

1. Section 055600 – Metal Castings

2. Section 099723 – Concrete Coatings

1.2 REFERENCE

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

1. ASTM C 76 - Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.

2. ASTM C 478 - Specification for Precast Reinforced Concrete Manhole Sections

3. ASTM C 32 - Specification for Sewer and Manhole Brick (Made for Clay or Shale)

4. ASTM C 443 - Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets [Metric]

1.3 SUBMITTALS

A. Shop Drawings: Submit shop drawings of sewer manholes as specified in Division 1.

B. Quality Control: Submit shop and field test reports of concrete samples tested in an approved laboratory.

1.4 DELIVERY, STORAGE AND HANDLING

A. General: Take every precaution to prevent injury to the manhole sections during transportation and unloading. Unload manhole sections using skids, pipe hooks, rope slings, or suitable power equipment, if necessary, and keep the sections under control at all times. Do not allow the manhole sections to be dropped, dumped or dragged under any conditions. Follow applicable requirements specified in Division 1.

B. Damaged Section: If any manhole section is damaged in the process of transportation or handling (see Section 2.3.C below), contact the Public Utilities Wastewater Department for visual inspection. If the Wastewater Department deems it necessary to reject the manhole section, reject and immediately remove such sections from the site, and replace the damaged manhole sections at no increase in Contract Amount.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. See County Approved Product List, Appendix F, for acceptable manufacturers of plastic joint sealing compound and sewer manhole frames and covers.

2.2 MATERIALS

A. Concrete, Steel Reinforcement and Aggregates: Provide reinforced concrete, cementitious materials, aggregates and steel reinforcement conforming to the requirements of ASTM C 478, with 4000 psi concrete, Grade 40 reinforcement bars, Type II cement, and a minimum wall thickness of 8 inches.

B. Steel reinforced polymer concrete manholes may be furnished and installed instead of the Type II cement manholes described above. If provided, steel reinforced polymer concrete manholes shall not require interior and exterior protection as described in part 3.1 F and 3.1 G. All steel reinforced polymer concrete structures shall be supplied by a qualified company with a minimum of 5 years' experience manufacturing polymer concrete. All steel reinforced polymer concrete structures shall be manufactured and installed in accordance with the applicable requirements of ASTM C76, C478, C443, D6783, C33, C267, A82, A165, A496, A497, A615, and A615M.

C. Manhole Frames and Covers: Provide manhole frames and covers as shown on the Collier County Standard details. Castings for manhole frames, covers and other items shall conform to the ASTM Designation A48, Class 30. Castings shall be true to pattern in form and dimensions and free of pouring faults and other defects in positions which would impair their strength, or otherwise make them unfit for the service intended. The scating surfaces between frames and covers shall be machined to fit true so the frames and covers do not shift under traffic

conditions or permit entry of storm water from flooding. Lifting or “pick” holes shall be provided, but shall not penetrate the cover. The words SANITARY SEWER, as well as COLLIER COUNTY shall be cast in all manhole covers except those owned by a private party. All manhole frames and covers shall be traffic bearing unless otherwise specified. Frames and covers shall be fully bedded in mortar to the correct finished grade elevation with materials shown in the COUNTY’s Standard Detail Drawings.

D. Preformed Joint Sealing Compound: Provide preformed joint sealing compound for joining manhole sections.

E. Concrete Protective Liner: Provide concrete protective liner conforming to Section 02608.

F. Pipeline Connections: Provide neoprene boots with type 316 stainless steel clamps of a design approved by the County Manager or designee for joining sewers to manhole riser sections. Fill the unfilled portion of the connection with mortar or concrete to guarantee a watertight seal.

G. Doghouse Manholes: Doghouse manholes over existing sanitary sewer pipes are permitted, and in a number of instances, preferred. Provide a concrete base a minimum of 8 inches thick, with proper reinforcing rods to prevent cracking. Pour concrete base upon a 12-inch base of gravel. Precast manhole rings may be set in the concrete over the existing pipe. Concrete should then be used to form both the bench and to seal the pipe entrances, both inside and especially outside. Once dry, remove the top of the pipe in the manhole.

H. Standard Manholes: The standard manhole shall be 4 feet or more in depth measured from the base of the cover frame to the top of the concrete footing and shall be of the concentric cone type, as shown in the Standard Details. If the manhole is 4 feet or less in depth, it shall be classified as a "Shallow Manhole" as specified below.

I. Shallow Manholes: The shallow manhole shall be 4 feet or less in depth measured from the base of the cover frame to the top of the concrete footing and shall be of flat top construction, as shown in the Standard Details.

J. Manhole Inverts: Form manhole inverts from concrete having a minimum 28 day compressive strength of 2500 psi, and as shown in the Standard Details. Inverts for "straight-through" manholes may be formed by laying the pipe straight through the manhole, pouring the concrete invert, and then cutting out the top half of the pipe. Construct curved inverts of concrete, as shown in the Standard Details, and form a smooth, even, half pipe section. Precast inverts may be used, however, no large "bowls" shall be permitted in the center of the manhole. To alleviate this problem, grout the invert to form a smooth, uniform invert as shown in the Standard Details. Maintain a 0.1 foot drop across the manhole.

K. Inflow Protectors: In all manholes, install an inflow protector manufactured from a high-quality 304 stainless steel with a consistent thickness of not less than 18 gage (see County Approved Product List, Appendix F). The inflow shall have a deep-dish bowl design with no less than 8 inches in depth to allow easy and unobstructed removal of the manhole cover. The manhole inflow protector is to be manufactured with a one-piece rubber gasket installed at the factory for a tight, consistent fit. The rubber gasket is to be designed to securely wrap around the entire leading edge of the inflow protector at the point where it comes in contact with the manhole frame and cover. The wrap around rubber gasket is to be manufactured to a width of no less than 3/8 inches, consistent on top and bottom of the leading edge of the inflow protector. The gasket shall be no more than 3/32 inches thick. The insert removal handle shall be manufactured of a high-quality stainless steel for strength and durability. The handle is installed in such a way that it does not interfere with the installation or removal of the manhole lid. The insert handle will be manufactured to withstand a minimum pull force of 500 pounds before it fails or separates from the insert. The inscription "PROPERTY OF COLLIER COUNTY UTILITIES" shall be etched, at the base of the handle frame, to provide a long-lasting identification marker for the COUNTY.

L. Chimney Seals: Install a minimum of two (2) precast concrete or HDPE riser rings with a chimney seal (see County Approved Product List, Appendix F) between manhole and cast iron frame.

2.3 SOURCE QUALITY CONTROL

A. If requested by the County Manager or designee, at least three cylinders shall be taken each day that manhole sections are cast, with batch samples to be designated by the laboratory representative. At least one set of cylinders will be taken from each 9 cubic yards of concrete used in manhole section construction. These samples will be tested for strength. If the samples fail to meet specified minimum concrete strength requirements, all manhole sections manufactured from the concrete from which the cylinders were made will be rejected.

B. The County Manager or designee reserves the right to core manholes either at the job site or point of delivery to validate strength of concrete and placement of steel. If cores fail to demonstrate the required strength or indicate incorrect placement of reinforcing steel, all sections not previously tested will be considered rejected until sufficient additional cores are tested, at no increase in Contract Amount, to substantiate conformance to these requirements.

C. Components of the manhole shall be free of fractures, cracks, and undue roughness. Concrete shall be free of defects, which indicate improper mixing or placing, and surface defects such as honeycomb or spalling. Cracks or broken ends due to improper handling will not be acceptable. No lift holes will be allowed except in rise and corbel sections. These holes shall not penetrate the wall and shall be filled with non-shrink grout after installation.

PART 3 EXECUTION

3.1 INSTALLATION

A. Lifting Holes: Grout lifting holes through the structure with non-shrink grout.

B. Precast Base: Provide a precast base of not less than 8 inches in thickness with a minimum dimension across the precast base of 72 inches poured monolithically with the bottom section of the manhole walls, reinforced, with a minimum 28-day compressive strength of 3000 psi.

C. Joining Manhole Sections: Join precast sections using plastic joint sealing compound (see County Approved Product List, Appendix F) and trimmed prior to grouting. The first construction joint shall be not less than 2 feet above the base slab. Use tongue and groove joints suitable for the flexible gasket. Use non-shrink grout inside and outside for sealing between manhole precast sections. Grout shall be of a type acceptable to the County Manager or designee and designed for use in water. Seal all openings and joints watertight.

D. Top Termination: Terminate manhole tops at such elevations as will permit laying up grade rings under the manhole frame to make allowances for future street grade adjustments.

E. Drop Connections: Manufacture drop connections, where required on precast manholes, with the manhole elements at the casting yard. Drop manholes shall be constructed per the Collier County Standard Details.

F. Internal Protection: Provide internal protection for all manholes by either of the following (not required for steel reinforced polymer concrete manholes as described in 2.2 B. above):

1. Sewpercoat, or

2. IET Coating system, or

3. Raven Lining Systems

Install the coating systems per manufacturer's recommendation and completely protect the structure from corrosion. The liner or coating systems must extend and seal onto manhole ring, seal onto and around pipe openings, and any other protrusions, completely cover the bench and flow invert. Provide a five (5)-year unlimited warranty on all workmanship and products. The work includes the surface preparation and application of the coating or liner system, and shall protect the structure for at least five (5) years from all leaks and from failure due to corrosion from exposure to corrosive gases such as hydrogen sulfide.
Repair internal coating of existing manholes cored during tie-in of new sewers by applying approved coating material as listed above in accordance with the manufacturer's recommendations. If existing manhole has an internal coating

other than that listed above, sandblast the interior of the existing manhole and apply an approved coating in accordance with the manufacturer's recommendations.

G. Coal Tar Epoxy: Coat all manhole, wet well, and valve vault exteriors with two (2) coats of coal tar epoxy to a minimum thickness of 8 dry mils (not required for steel reinforced polymer concrete manholes as described in 2.2 B. above).

END OF SECTION