

SECTION 1 - GENERAL

Directions to Specifications writer:

*Omit any article not applicable to the Project (unless otherwise indicated).
Revise any text as appropriate to the Project (unless otherwise indicated).
References noted are as follows.*

*Note 1 -- Use this text as a general guide to assist in formulating
Project-specific text.*

Note 2 -- Choose one option, or neither option.

*Note 3 -- Use if Project requires assurance of prioritized
construction (see Article 19 of General Conditions).*

Note 4 -- Use if Project is within ROW of other jurisdictions.

1.01 LOCATION OF THE WORK SITE AND ACCESS

The general location of the proposed Work for the Project is

[Note: Describe here any specific location necessary to identify the Work site.]

[Note: Include the following for all Projects.]

Access to the Work site shall be over public streets and rights-of-way. Any damage to existing pavement or other surface improvements outside the Contract Pay Limits, attributable to the Contractor's activities, shall be restored to like-new condition by the Contractor at the Contractor's expense.

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1.02 SCOPE OF WORK

The essential portions of the proposed Work for the Project are summarized as follows: *[Insert the same complete information describing the Work to be performed as summarized on the Advertisement for Bids]*

Estimated quantities and Contract Pay Items are listed in the Proposal.

1.03 ESTIMATED QUANTITIES

The estimated quantities listed in the Proposal for the various Contract Pay Items shall be used for the purposes of comparing Bids and determining amounts for which the Bid and performance Bonds shall be furnished. Certain estimated quantities listed are greater than the quantities required to complete the Work as shown on the Plans. The greater quantities and quantities of work items not shown may be for contingent work; compensation for contingent work will be made if required and approved by the Engineer in writing. The City reserves the right to vary the estimated quantities or to delete the Work and the corresponding Contract Pay Items from the Contract. The Contractor will be compensated for Work actually performed as indicated on the Plans, in the Specifications, or authorized by the Engineer, all in accordance with the unit prices and lump sum prices contained in the Proposal. The Bidder shall quote in the Proposal a unit or lump sum price for which he will perform the Work for each of the Contract Pay Items.

1.04 PLANS AND SPECIFICATIONS

Technical Specifications Section 1 [and _____] has [have] been prepared specifically for this Project. Other Technical Specifications sections are City Standards and only the applicable portions of them govern the Work to be performed. Where the Plans and Specifications are not in agreement, the Plans shall govern. Where a specifically prepared Technical Specifications section is not in agreement with City Standards Technical Specifications, the specifically prepared section shall govern.

The Contractor shall furnish all labor, equipment, and materials [, with the exception of City-furnished hydrants,] to construct the Project and all miscellaneous and appurtenant work complete in place as specifically described and included under each Contract Pay Item as shown, specified, or directed by the Engineer in accordance with the obvious or expressed intent of the Contract. The list of drawings comprising the Plans for Project No. _____ is shown on [Sheet 1 of the Plans] [Drawing No. _____].

[Edit the following, if necessary]

The Technical Specifications for the Project that reference FDOT-SSRBC (*Florida Department of Transportation - Standard Specifications for Road and Bridge Construction*) pertain to the 2007 Edition except "SECTION 8 - PAVING MATERIALS" and "SECTION 9 - ROADWAY CONSTRUCTION" (as noted at the beginning of each of those sections).

1.05 FIELD ENGINEERING

The Contractor shall establish and provide all vertical and horizontal control points for this Project including benchmarks. The Contractor shall provide the field layout surveying necessary to properly construct the Work from City-furnished control points or reference points indicated on the Plans.

All field layout surveying shall be performed under the supervision of a Professional Land Surveyor (Chapter 472, Florida Statutes). The Contractor shall submit the name and registration number of said Surveyor as directed by the Engineer. The Engineer reserves the right to check all survey staking and to require adjustments or re-staking by the Contractor in the event that conflicts or errors are detected.

Water pressure pipelines that are 8-inch or less diameter shall be installed with the required cover using horizontal control stakes provided by the Contractor. Storm drains, sanitary sewers, sanitary pressure pipelines, and water pressure pipelines greater than 8-inch diameter shall be installed using an approved method for line and grade control. Methods for line and grade control shall be submitted to the Engineer for approval, as specified for shop drawings. Sketches shall be provided by the Contractor showing vertical adjustment necessary for pressure pipelines to adequately clear storm drains and other utilities, unless otherwise shown on the Plans.

1.06 SAFEGUARDING SURVEY MARKS

The Contractor shall safeguard all existing property monuments, benchmarks, and other survey marks adjacent to and within the Project limits, and shall bear the cost of re-establishing them if disturbed or destroyed.

1.07 INSPECTION AUTHORITY

The Engineer has ultimate responsibility for Contract administration and inspection for this Project. The Engineer may assign field inspection responsibilities to a Design Professional and/or City Inspector.

Each step of construction is subject to approval by the Engineer prior to proceeding with a subsequent step in accordance with the *General Conditions* article headed "Tests and Inspections" and as supplemented herein.

During the progress of the Work and up to the date of final acceptance, the Contractor shall at all times afford representatives of the City, the County, the State, the Department of Environmental Protection, the Department of Labor, or any other agency with jurisdiction, a reasonable, safe, and proper facility for observation of the Work done or being done at the site and also of the manufacture or preparation of materials and equipment at the place of such manufacture or preparation.

The Project line of authority will be presented at the Preconstruction Conference.

1.08 PROJECT SCHEDULE

[Use for all Projects.]

The Contractor shall submit a Project schedule in accordance with *General Conditions* articles headed "Project Schedule" and "Progress Charts" and as supplemented herein.

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[Note 2; Add for small Projects and less complex Projects.]

Scheduling and progress reporting shall be accomplished by the use of a bar chart to provide a clear and concise comparison of progress.

[Note 2; Add for large Projects and complex Projects. For complete text, see the Design Manager]

General: The Contractor shall prepare a Work Schedule Progress Chart for this Project consisting of a network analysis system as generally described herein. In preparing this system the scheduling of construction is the responsibility of the Contractor to assure adequate planning and execution of the Work and to assist the Engineer in appraising the reasonableness of the proposed Schedule and evaluating the progress of the Work. The system shall consist of diagrams and accompanying mathematical analyses.

1.09 PROJECT START TIME *[Note: Revise number of days, and list equipment/materials]*

A. For this Project, a period not to exceed *[60]* _____ calendar days will be allowed following the date of the issuance of the Notice to Proceed, to provide time for acquisition of the following custom equipment and materials:

1. _____
2. _____

B. Contract Time will begin on the *[61st]* calendar day after issuance of the Notice to Proceed or on the actual day that the Contractor commences Work at the site, whichever is the earlier. Extension of Contract Time shall be requested in the manner set forth in the *General Conditions* article headed "Changes in the Work," subsection headed "Changes in Contract Time," and shall include:

1. Manufacturer's signed affidavit stating reason for delay and lead time required.
2. Number of calendar days requested.
3. Reasons Contract Time must be extended.
4. Stipulation of all Work, including Schedule, which is to be performed during the grace period.
5. List of what insurance and bonds will be active.

C. Documentation shall be presented to the City prior to, or during, the Preconstruction Conference.

D. It may be possible that certain Work items can be accomplished by the Contractor prior to receipt of the custom equipment or materials if, in the opinion of the Engineer, *[City use of the facility]* *[use of the facility]* *[traffic]* *[_____]* is not impacted.

E. Failure of the Contractor to substantively obtain the custom equipment or materials, if through no fault of the City, will not be justification for extending the Contract Time extension beyond the above maximum duration.

1.10 STORM PREPAREDNESS PLAN

Within 15 days of the date of Notice to Proceed, the Contractor shall file with the Engineer a Storm Preparedness Plan. The plan shall outline the necessary measures the Contractor proposes to perform at no additional cost to the City upon the issuance of an official storm warning issued by the National Weather Service.

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In the event of inclement weather, or at the Engineer's direction, the Contractor shall carefully protect the Work, private property affected by the Work, and stored materials against damage or injury from the weather. If, in the opinion of Engineer, any portion of the Work or materials is damaged or injured by reason of failure on the part of the Contractor to protect the Work, such Work and materials shall be removed and replaced at the Contractor's expense.

1.11 MATERIALS AND EQUIPMENT

All materials, appurtenances, and types of construction shall be in accordance with the Technical Specifications and shall in no event be less than that necessary to conform to the requirements of all applicable laws and regulations.

All materials and equipment to be incorporated into the Work shall be new, unused, and correctly designed. They shall be of standard first grade quality, produced by expert workmen, and be intended for the use for which they are offered. Materials or equipment which, in the opinion of the Engineer, are inferior or of a lower grade than indicated, specified, or required, will not be accepted.

[Note: Include the following 2 paragraphs "as written" for all Projects.]

Only "Asbestos-Free" materials shall be incorporated into the Work, unless the Technical Specifications specifically call for otherwise. Material suspected of being Regulated Asbestos Containing Material (RACM), includes but is not limited to: thermal and acoustic insulation, joint compound, mastic, adhesive, vinyl floor tile and sheeting, ceiling tile, plaster, wall board, roofing felt, and shingle. Shop drawings for material or equipment suspected of being RACM shall list all contents, shall be noted "Asbestos-Free," and shall be screened by the Contractor prior to submittal to confirm that it is "Asbestos-Free." All materials delivered to the Project site shall have been approved through the shop drawing procedure and shall be in their original labeled and unopened containers.

In the event that asbestos-containing material installed by the Contractor is discovered either during construction, following completion of construction, or following acceptance of the Contract Work by the City and closeout of the Contract, it will be the responsibility of the Contractor to pay all costs incurred to remove and replace those materials, including repair or replacement of all adjacent materials which are affected by the abatement process.

1.12 MANUFACTURER

The names of proposed manufacturers, manufacturers' representatives, suppliers, and dealers who are to furnish materials, fixtures, equipment, appurtenances, or other fittings, shall be submitted by the Contractor to the Engineer for approval in accordance with the *General Conditions* article headed "Shop Drawings and Submittals" to afford proper investigation and checking. No manufacturer will be approved for any materials, fixtures, equipment, appurtenances, or other fittings to be furnished under this Contract unless the manufacturer is of good reputation and has a plant of ample capacity. The Contractor shall, upon the request of the Engineer, be required to submit evidence that the manufacturer has manufactured a product similar to the one specified and that the product has been used for a like purpose for a sufficient length of time to demonstrate its satisfactory performance. All transactions with the manufacturer and subcontractors shall be through the Contractor.

Any two or more pieces of material or equipment of the same kind, type, or classification and being used for identical types of service, shall be made by the same manufacturer.

1.13 SAMPLES

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The Contractor shall, when required, submit to the Engineer for approval, typical samples of material and appurtenances. The samples shall be properly identified by tags and shall be submitted sufficiently in advance of the time when they are to be incorporated into the Work so that rejections thereof will not cause delay. A letter of transmittal from the Contractor requesting approval shall accompany all such samples.

1.14 EQUIVALENT QUALITY

In the Contract Documents, whenever an article, material, apparatus, equipment, or process is called for by trade name or by name of a patentee, manufacturer, or dealer, or by reference to catalog of a manufacturer or dealer, it shall be understood as intending to mean and specify the article, material, apparatus, equipment, or process designated, or, upon approval of the Engineer, any equal thereto in quality, finish, design, efficiency, and durability, and equally serviceable for the purposes for which it is intended.

Whenever material or equipment is submitted for approval as being equal to that specified, the submittal shall include sufficient information and data to demonstrate that the material or equipment conforms to the Contract requirements. The decision as to whether or not such material or equipment is equal to that specified shall be made by the Engineer.

Upon rejection of any material or equipment submitted as the equivalent of that specifically named in the Contract, the Contractor shall immediately proceed to furnish the designated material or equipment.

Neither the approval by the Engineer of alternate material or equipment as being equivalent to that specified, nor the furnishing of the material or equipment specified, shall in any way relieve the Contractor of responsibility for failure of the material or equipment, due to faulty design, material, or workmanship, to perform the functions required of them by the Contract Documents.

1.15 MATERIAL AND EQUIPMENT DELIVERY AND STORAGE

In conformance with the *General Conditions* article headed "Material and Equipment Delivery" the Contractor shall deliver materials in ample quantities to ensure the most speedy and uninterrupted progress of the Work to complete the Work within the allotted time. The Contractor shall also coordinate deliveries in order to avoid delay in, or impediment of, the progress of the Work of any related contractor. The Contractor shall provide space for storage of materials and equipment.

Pipe strung along roads and rights-of-way shall be placed in a manner that will not endanger or restrict pedestrian or vehicular traffic.

1.16 SERVICE OF MANUFACTURER'S REPRESENTATIVE

The Contract amount shall include the cost of furnishing a competent and experienced representative of the equipment manufacturer who shall assist the Contractor, when required, to install, adjust, test, and place in operation the equipment in conformity with the Contract Documents. After the equipment is placed in operation, the representative shall make all adjustments and tests required by the Engineer to prove that the installed equipment is in proper and satisfactory operating condition. The representative shall instruct personnel designated by the Engineer in the proper operation and maintenance of such equipment.

1.17 CONTAMINANTS CONTAINMENT/DISPOSITION [Note 1]

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- A. Prior to the installation of well points for dewatering, the Contractor shall visually inspect the Work area for indications of existing ground water monitoring, wells, or metal caps at grade. The Contractor shall review the Work area for monitoring wells or abandoned fuel tanks, and shall notify the Engineer in writing if any of the above items exist.
- B. If during the dewatering activities the spoil water becomes odorous (excluding sulfur odor) or the spoil water is discolored (excluding tannic acid or iron), the Contractor shall stop the dewatering activities and shall notify the Engineer in writing of such, and request direction.
- C. When Work activities encounter or expose any abnormal condition that may indicate the existence of a hazardous or toxic waste, Work activities shall stop in the vicinity of the abnormal condition and the Contractor shall notify the Engineer immediately. The presence of tanks or barrels; discolored earth, metal, wood, or groundwater; visible fumes; abnormal odors; excessively hot earth; smoke; or other conditions that appear abnormal, may be signs of hazardous or toxic wastes and shall be treated with extraordinary caution.

Every effort shall be made by the Contractor to minimize the spread of any hazardous or toxic waste into uncontaminated areas.

The Contractor's operations shall not resume until directed in writing by the Engineer.

Disposition of the hazardous or toxic waste will be made in accordance with the requirements and regulations of any City, County, State, or Federal agency having jurisdiction. Where the Contractor performs work necessary to dispose of hazardous or toxic waste, and the Contract does not include Pay Items for disposal, payment may be made as provided in the *Contract Standards: General Conditions* article headed "Unforeseen Subsurface Conditions."

1.18 PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION

The Contractor shall be responsible for prevention, control, and abatement of erosion, siltation, and water pollution resulting from construction of the Project until final acceptance of the Project.

The Contractor shall implement all appropriate turbidity management practices at the point of discharge into a storm drainage system, gutter, or other conveyance to ensure that state water quality standards are not violated at the point where the storm drain, gutter, or other conveyance discharges into a surface water.

All necessary provisions shall be taken to ensure compliance with the water quality standards of the State of Florida. Attention is called to Chapter 62-302, Florida Administrative Code, and in particular, the requirements that turbidity shall not exceed 29 NTUs above background level. Adequate silt containment procedures and equipment shall be used to control turbidity, at no additional cost to the City.

1.19 MAINTENANCE OF STORM DRAINAGE SYSTEM

The Contractor shall be responsible at all times to maintain the operation of existing stormwater facilities, or, when existing stormwater facilities are removed, to provide equivalent capacity alternate forms of stormwater removal adequate to prevent upstream flooding in excess of existing conditions. This responsibility shall include the installation of temporary connections, bypass pumping, or other temporary means necessary until the new drainage system is fully operational.

[Note: Because the City may be subject to significant fines due to the action and/or negligence of the Contractor, include the following sub-section "as written" for all Projects. (Consent Order 97-0314 expired in February 2010.)]

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1.20 SPILL OR DISCHARGE OF WASTEWATER OR RECLAIMED WATER

The discharge of wastewater or effluent (reclaimed water) into waters of the State and/or into canals, ditches, and ponds that are connected to waters of the State is prohibited. Any spill or discharge of wastewater or reclaimed water shall be immediately reported to the Engineer, the City's Wastewater Collection System Manager (892-5612), and the City's Emergency Dispatch Center (893-7261). In the event of a spill or discharge, the Contractor shall immediately control, contain, and stop the spill or discharge and shall repair any damage to the City's facilities. The Contractor shall be responsible for any penalties and costs charged to the City by the FDEP and for all costs incurred by the City as a result of the Contractor's actions or as a result of the Contractor's negligence.

1.21 SEQUENCE OF OPERATION *[Notes 1 & 3]*

A. General - Pipeline Work *[Option 1]*

It is the intent of the City that all pipeline work associated with the Project be installed to completion in a timely and orderly manner so as to minimize inconvenience to the Public.

The Contractor shall include in the Project Schedule a Sequence of Operations conforming to the following order:

1. Store or string pipe materials at locations and in a manner as approved by the Engineer. Pipe and pipe materials shall not be stored or strung in residential areas more than 3 weeks in advance of pipe installation unless otherwise approved by the Engineer.
2. Backfill installed pipe in accordance with the Technical Specifications as soon as practical.
3. Test the installed pipe, if required, in accordance with the Technical Specifications. Make repairs as necessary.
4. Disinfect the installed pipe, if required, in accordance with the Technical Specifications.
5. Restore the ground surface in accordance with the Technical Specifications.

B. General - Plant and Miscellaneous *[Option 2]*

It is essential that any Project Work conducted at Plant sites be sequenced to minimize interference with normal daily operations of the Plant.

The Contractor shall include in the Project Schedule a Sequence of Operations conforming to the following order:

1. Store equipment and materials at locations and in a manner approved by the Engineer.
2. Confine work and personnel to designated areas in accordance with the Specifications.
3. Clean up work areas daily so as to present a safe and neat appearing work site.

[Note: Describe here, in correct order, any specific items necessary to further clarify the Sequence of Operations for the Project.]

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- C. Utility Companies may be present on the Work site adjusting their facilities and installing new facilities. The Contractor's work shall be scheduled in such a manner as to minimize conflicts with various utility companies.
- D. The Contractor shall clean up the site for each phase of Work in accordance with the Contract Documents before proceeding to a subsequent phase of Work, unless otherwise approved by the Engineer.

[Note: Describe here, in correct order, any specific items necessary to further clarify the Sequence of Operations for the Project.]

E. No Time Extension

If the Engineer orders construction, or a phase of construction, to be stopped due to the Contractor's failure to adhere to the Sequence of Operations as outlined herein, the Stop Work Order shall not constitute a basis for extension of time.

F. Sequence of Construction *[List significant tasks that require a certain sequence of completion] [Note 3]*

1.22 WORK IN STREETS AND HIGHWAYS *[Note 4]*

All Work within streets and highways shall be subject to the regulations and requirements of the appropriate agencies. Streets and highways are under the jurisdiction of _____ for this Project.

Methods and materials of construction used in restoration within such streets and highways shall conform to the requirements, inspection, and approval of the duly authorized representatives of the appropriate agency having jurisdiction. Restoration Work shall include: removal and replacement of pavement, sidewalk, curb, and gutter; replacement of storm drainage facilities; excavation and backfilling; and storage of materials and equipment.

1.23 WORK IN PRIVATE PROPERTY

In the event that, in the opinion of the Contractor, obtaining a temporary construction easement outside the limits of the right-of-way, of City-owned property, or of the easement(s) obtained by the City is necessary or desirable, it shall be the sole responsibility of the Contractor to obtain such temporary easement from the owner of the property. If such easement is obtained by the Contractor it shall contain provision to hold the City harmless from any operations of the Contractor within the easement limits. The Contractor shall not conduct construction operations on private property outside the limits of the right-of-way, of City-owned property, or of the easement(s) obtained by the City unless a copy of the Temporary Construction Easement Agreement is filed with the Engineer.

Upon completion of Work in easements, the Contractor shall restore the property, including all fences or other structures disturbed by his operations, to as good as or better than the condition in which he found it.

1.24 PERMITS *[Note 2, Option 1; also, cross out agencies not applicable.] [For Projects within R/W]*

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The City will obtain all construction permits required for the Work by DEP, DOT, CSXRR, SWFWMD, Army Corps of Engineers, Pinellas County Coastal Management, Pinellas County Highways, US Coast Guard, and Pinellas County Health Department. The Contractor shall be required to comply with all provisions of such permits regarding workmanship, schedules, notification of starting construction, and other conditions under which the permits are issued. A copy of these permits is available at the Office of the Engineering Director or is included in the Bid Document.

City permit will be required for tree removal. The Contractor shall secure such permit(s) at his own expense (the City's Urban Forester can be contacted at 893-7472).

The Contractor shall obtain and pay for all other Federal, State, or County permits, licenses, and other authorizations required for the prosecution of the Work, including the cost of all Work performed in compliance with the terms and conditions of such permits, licenses, and authorizations, whether performed by the Contractor or by others.

1.24 PERMITS *[Note 2, Option 2] [For building Projects]*

Construction projects performed for the City will require licenses and permits in the same manner as private construction projects within the City.

City permit will be required for tree removal. The Contractor shall secure such permit(s) at his own expense (the City's Urban Forester can be contacted at 893-7472).

The Contractor shall secure, at his expense, all licenses and permits, and shall comply with all applicable laws, regulations, and codes as required by the State of Florida and/or the City of St. Petersburg. The permit fee schedule for the general construction, grounds improvement, electrical, plumbing, mechanical, and other Work is on file at the City Construction Services and Permitting Division, Municipal Services Center, One Fourth Street North, St. Petersburg, Florida, (727/893-7231). City Building Permit No. _____ will be required for the Project; the estimated cost is \$_____.

City permits for this Project will include: Demolition *[Cross out permits not applicable.]*
Building
Plumbing
Electrical
Mechanical
Site Utilities
Fire System
Parking/Paving/Landscaping
Temporary Use (material storage / use of private property)

1.25 FIELD OFFICE AND APPURTENANT STRUCTURES

General: All structures for use by the Contractor or Engineer shall be temporary. Permanent facilities shall not be used for field offices or for storage. Structures may be new or used, but must

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be serviceable, adequate for the required purpose, and shall be in compliance with all applicable codes or regulations.

All security requirements for such facilities shall be provided and maintained by the Contractor.

Before the Final Payment will be paid, and as directed by the Engineer, the Contractor shall clean up the area, remove any temporary facilities, finish grade, and restore the area to its original condition as determined by the Engineer.

Contractor's Field Office: A field office and work sheds required by the Contractor shall be furnished, installed, and maintained during the entire construction period by the Contractor at his own expense and no separate payment will be made therefore.

Space on City property or rights-of-way proposed to be used for storage and as a field office for the Contractor shall be approved by the Engineer prior to installation, providing such uses will not interfere in any manner with the construction of the Work or the operation of existing facilities.

Engineer's Field Office: *[Note 1]*

The Contractor shall furnish, install, and maintain a separate temporary field office space for the sole use of the Engineer during the entire construction period. Secure entrance doors and one key per occupant shall be furnished. Space on the construction site shall be approved by the Engineer prior to installation.

The Contractor shall make all provisions and pay all installations and other costs for the Engineer's field office in order to provide telephone service, power service, and exterior lights at the Project site available for the Engineer's use. The Contractor shall pay all monthly charges for the various services provided to the Engineer's office throughout the construction period.

The Contractor shall provide a minimum of 150 square feet of floor space and shall equip the Engineer's field office including, but not limited to, the following:

Windows:

- a. Operable sash and insect screens
- b. Locate to provide view of construction areas

Furnishings:

- a. 1 Standard size desk, 3-foot by 5-foot with 3 drawers and desk chair
- b. 1 Drafting table, 39-inch by 72-inch by 36-inch high with 1 equipment drawer
- c. 1 Folding table, 3-foot by 6-foot
- d. 1 Plan rack to hold a minimum of 6 sets of Project drawings
- e. 1 Standard 4-drawer legal-size metal filing cabinet with locks and keys
- f. 2 Straight chairs
- g. 1 Drafting table stool
- h. 2 Wastebaskets
- i. 1 Tackboard, 36-inch by 30-inch
- j. Outside thermometers

Services:

- a. Lighting: 50-foot-candles at desk top height
- b. Exterior lighting at entrance door
- c. Automatic heating and mechanical cooling equipment sufficient to maintain comfort

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- d. Electric convenience duplex outlets: 4 minimum, 110-volt, at least 1 on each wall
- e. Electric distribution panel: 2 circuits minimum, 110-volt, 60 hertz service
- f. Convenient access to drinking water (water cooler) and toilet facilities
- g. Telephone: 1 direct line instrument with local access

1.26 CONTRACTOR'S SIGN [Option 1]

No sign by the Contractor, any subcontractor, or any material supplier, will be allowed on the Project site.

1.26 PROJECT SIGN [Option 2]

The City shall furnish the Project sign. The Contractor shall erect the sign and maintain it for the duration of the Project.

The Contractor shall mount the sign using 4-inch pressure treated lumber or as approved by the Engineer, and other supports as required, at a location mutually agreed by the Engineer and the Contractor.

If the sign becomes unusable due to damage, vandalism, or any means other than Contractor activity, the City will furnish a replacement sign at no cost to the Contractor. If the sign is damaged by Contractor activity, the Contractor shall replace the sign in-kind at no additional cost to the City.

Payment for installing and maintaining the Project sign shall be incidental to construction costs of the Project for the duration of the Contract. The sign will remain the property of the City upon completion of the Project.

No sign other than as shown on the Plans and/or as specified, either by the Contractor, any subcontractor, or any material supplier, will be allowed on the Project site.

1.26 PROJECT SIGN AND PLAQUE [Option 3]

A. Project Sign

The City shall furnish the Project sign. The Contractor shall erect the sign and maintain it for the duration of the Project.

The Contractor shall mount the sign using 4-inch pressure treated lumber or as approved by the Engineer, and other supports as required, at a location mutually agreed by the Engineer and the Contractor.

If the sign becomes unusable due to damage, vandalism, or any means other than Contractor activity, the City will furnish a replacement sign at no cost to the Contractor. If the sign is damaged by Contractor activity, the Contractor shall replace the sign in-kind at no additional cost to the City.

Payment for installing and maintaining the Project sign shall be incidental to construction costs of the Project for the duration of the Contract. The sign will remain the property of the City upon completion of the Project.

No sign other than as shown on the Plans and/or as specified, either by the Contractor, any subcontractor, or any material supplier, will be allowed on the Project site.

B. Plaque

The Contractor shall furnish and install any structure plaque as shown on the Plans and as specified. Cost of the plaque shall be incidental to construction costs of the Project. The plaque shall become a permanent part of the structure.

The plaque shall be bronze and approximately 12-inch square. Graphic design, style of lettering, colors and location shall be as approved by the Engineer.

The plaque shall include:

- Name of structure
- Date of construction completion
- City of St. Petersburg
- Names and titles of authorities as directed by the City
- Name of Engineer
- Prime Contractor and major subcontractors

1.27 MOBILIZATION *[Note 1]*

Mobilization shall include all preparatory work and operations necessary to begin the Project, including moving of personnel, equipment, plant, and all else necessary to commence work. The cost of bonds, insurance, shop drawings, and preconstruction expenses shall also be included.

If a separate Pay Item is included for mobilization, payment will be as specified for that Pay Item. If no Pay Item is included, costs for mobilization shall be included with the costs for the major Work items included in the Proposal.

1.28 WATER PURCHASE

Water used in connection with this Project may be purchased from the Water Resources Department, 1650 Third Avenue North, in accordance with the provisions of applicable ordinances, procedures, and regulations.

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1.29 TRAFFIC CONTROL *[Note 2, Option 1]*

The Contractor shall provide required traffic controls under City observation. The Contractor shall notify the Transportation Special Events Division of the Stormwater, Pavement & Traffic Operations Department a minimum of 2 working days prior to any construction affecting traffic flow. A Maintenance of Traffic plan drawing shall be submitted for review by the Engineer prior to each lane closure or opening during the course of construction. All traffic control devices utilized during construction shall be provided by the Contractor and meet the requirements set forth in the latest revision of U.S. Department of Transportation Federal Highway Administration's "Manual on Uniform Traffic Control Devices" and the Florida State Department of Transportation's "Design Standards." Failure or refusal, on the part of the Contractor, to install, maintain and/or position traffic control devices promptly, fully, and in an acceptable manner, shall be sufficient cause for the City, after 24-hour notice, to perform the traffic control with its own organization, or to contract with any other individual, firm, or corporation to perform the required traffic control. All costs and expenses incurred thereby shall be charged against the defaulting Contractor, and the amount thereof deducted from any money due, or which may become due him, or shall be charged against the Contract Bond. Any Work performed as described by this paragraph, shall not relieve the Contractor in any way of his responsibility for the Work performed by him.

[Note: Add other directions as necessary to address MOT requirements specific to Project, such as the following.]

Traffic control shall be performed so that vehicular traffic shall be maintained on _____ (Street or Avenue) with at least one 10-foot wide lane in each direction at all times. An acceptable detour route shall be developed by the Contractor to redirect traffic when and where necessary, with the approval of the Transportation Special Events Division. Temporary lanes shall be constructed with a minimum 1-inch thick asphaltic concrete surface over a 6-inch thick limerock base compacted to 98% of the maximum density in accordance with AASHTO T-180.

Failure of the Contractor to comply with any of the above traffic control requirements may result in issuance of a stop work order until the violation is corrected.

1.29 TRAFFIC CONTROL *[Note 2, Option 2]*

The Contractor shall arrange his Work so that there will be as little disruption of traffic as possible. Two traffic lanes/Two-way traffic (*Note 2*) shall be kept open at all times in State and County roads. At least 72 hours before starting any Work the Contractor shall obtain a Closure Permit from the appropriate County or State agency for any traffic lane or street closure required. Street Closure Permits shall be submitted to the Engineer before starting any Work. No changes to approved Street Closure Permits will be permitted without prior approval. The Contractor shall furnish and maintain all necessary signs, barricades, lights, and flagmen necessary to control traffic and provide for safety of the public in compliance with the latest revision of U.S. Department of Transportation Federal Highway Administration's "Manual on Uniform Traffic Control Devices" and the Florida State Department of Transportation's "Design Standards" and to the satisfaction of the Engineer.

1.30 TREE PROTECTION

Particular care shall be taken by the Contractor to protect trees during construction by erecting approved barricades to prevent unnecessary damage to trunk and roots during construction. Such barriers shall protect the area within the dripline.

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The Contractor shall prune all branches that interfere with construction in accordance with American Forestry Association Standards. Roots over 2-inch diameter shall be preserved wherever possible. If root pruning is required, roots shall be cut cleanly.

Temporary soil deposits, concrete block, concrete wash, or solvents shall not be placed within the dripline. The grade within the dripline shall be preserved. If adjacent grade is altered, protective measures such as those described in the Florida State Division of Forestry "Tree Protection Manual for Builders and Developers" shall be constructed to protect the tree(s) from deleterious effects of the grade change.

1.31 TREE REMOVAL AND REPLACEMENT /TREE REMOVAL, REPLACEMENT, AND RELOCATION

As required by *St. Petersburg City Code "Chapter 16. Article XV. Division 5. Tree and Mangrove Protection"* a permit is required to remove any native tree or palm greater than 2-inch diameter measured 4.5 feet above the ground. The Contractor shall obtain any necessary tree removal permit, shall furnish and replace trees as required, and shall perform this Work in a manner conforming to all applicable provisions of said regulations or permit.

The cost of tree removal and obtaining the tree removal permits shall be included in the cost of the appropriate associated Contract Pay Item under which the Work is to be performed. The Contractor shall remove trees as required and approved by the Engineer whether or not said trees are shown on the Plans. Trees that have to be removed, except for Australian pine, Brazilian pepper, punk, and other exempt species, shall be replaced as directed. Replacement trees shall be of native species at least 8 feet tall and at least 3-inch caliper diameter.

[Note: Use the following paragraph for sidewalk and other appropriate Projects only.]

If the cost of removing and disposing of a desirable species of tree exceeds the cost of relocating the tree to a point not in conflict with the proposed construction, the City may order that the tree be relocated within the right-of-way, or to the abutting property owner's desired location or immediately adjoining the right-of-way. This applies to trees of a transplantable size and condition, greater than 2-inch diameter measured 4.5 feet above the ground, and generally less than 12 feet tall.

1.32 UTILITIES

Prior to construction, the Contractor shall familiarize himself with the location of all existing utilities and facilities within the Project Site and with the applicable provisions of the *General Conditions* article headed "Public Convenience and Safety."

The Contractor shall notify utility companies at least 48 hours, excluding Saturdays, Sundays, and legal holidays, prior to excavation. Utility companies shall be contacted by calling the utility notification center "Sunshine" at 1-800-432-4770. The City will furnish to the Contractor the available records of City utilities. The Contractor shall locate and mark all City utilities for his reference and for use by utility companies. The Contractor shall act as the City's agent for locating and marking City underground utilities within the Project limits, in accordance with the Florida Underground Facilities Damage Prevention and Safety Act (FS 556).

In all cases where existing utility lines may be interfered with by the Work, the Contractor shall give a minimum of 48 hours notice to the owners of such utilities to permit them to relocate the lines prior to construction. Existing utilities have been shown on the Plans insofar as information is reasonably available. However, it will be the Contractor's responsibility to preserve all existing utilities whether shown on the Plans or not.

1.33 NEIGHBORHOOD NOTIFICATION

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Not less than 7 days prior to the commencement of Work in the right-of-way, the Contractor shall notify all residents and businesses along the construction route with a printed door hanger notice indicating the scheduled date of construction, the type of construction, and the Contractor's and Superintendent's name, address, and telephone number. The notice shall contain wording indicating that the property owners or businesses should remove from the right-of-way any bush, flower, planting, landscaping materials, etc., that they wish to save. The door hanger text and a list of residents and businesses to which the notification has been delivered shall be compiled and submitted to the Engineer prior to the Contractor commencing Work in a particular block. After such notification, any such item remaining in the right-of-way and requiring removal shall be removed and disposed of by the Contractor. Restoration of such items will not be required of the Contractor, except for sodding of disturbed yard and parkway areas. However, the Contractor shall exercise reasonable caution in order to avoid damaging such items where possible.

1.34 SHOP, FIELD, AND LABORATORY TESTING

The Engineer may require testing by certified personnel of certain materials to be incorporated in the Work, such as: soils density, pavement, concrete pipe and appurtenances, and welds.

In the event any such testing is required by the Engineer, a detailed description will be found in these Technical Specifications concerned with the specific item of Work.

Where reference is made in the DOT-SSRBC for design mixes, tests of materials, or work performed, or where in the opinion of the Engineer, tests are required to ascertain compliance with the Specifications, the Contractor shall have such tests made by an approved testing laboratory. No additional payment will be made for these tests.

1.35 SOIL BORING DATA

Soil boring data, including groundwater elevations or conditions, are available for Bidder's inspection at the offices of the City Engineering & Capital Improvements Department. These data are presented only as information that is available which indicates certain conditions found and is limited to the exact locations on the dates indicated.

1.36 SOILS DENSITY TESTS

Soils density testing shall be performed by the City at no cost to the Contractor. Retesting of failed tests, in excess of 10 percent of tests performed, shall be at the expense of the Contractor. The Contractor may have independent soils compaction tests performed, at no cost to the City; however, the results of these tests may not constitute a basis for acceptance or rejection of the Work.

All soils used in backfill shall be compacted with suitable equipment in layers as specified. Maximum density shall be defined as the oven-dried density in pounds per cubic foot of the soil at optimum moisture content as determined by the latest revision of AASHTO T180.

Prior to any backfill operation, a representative sample of the backfill material shall be taken by certified personnel, and tested in a certified laboratory as approved by the Engineer, to determine the relationship between the moisture content and density of the material when compacted in accordance with AASHTO T180.

When the densities and corresponding moisture contents for the sample material have been plotted as specified, a curve shall be produced. The moisture content corresponding to the peak of the

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curve shall be termed the "optimum moisture content" of the sample under the above described compaction.

At least one representative sample, as described above, shall be taken thereafter for every significant observed change in soil characteristics or as ordered by the Engineer.

The maximum density of the representative sample as herein specified shall become the basis for determining the in-place percentage of maximum density required in the Technical Specification for the specific item of Work.

In-place density testing shall employ the use of nuclear equipment in accordance with the latest revision of AASHTO T238 Method B "Density of Soil and Soil-Aggregate in Place by Nuclear Methods."

In-place density shall be taken upon completion of each compaction layer or more often as ordered by the Engineer.

1.37 SPECIAL CONSIDERATIONS FOR PLANT WORK

A. Staging Area

The Contractor's use of plant property for storage of materials, parking of trailers, employee parking, and other uses, shall be as shown on the Plans. If no area is designated, the Contractor shall submit a staging plan to the Engineer for approval prior to mobilizing to the site. The Engineer and the plant chief operator will jointly approve this plan.

Contractors shall restrict operations to approved staging areas and parking areas. Use of unpaved areas for roadways and parking shall not be permitted unless approved in writing by the Engineer.

On-site, temporary fuel storage will not be allowed unless the method of storage is pre-approved in writing by the Engineer. All fuel storage shall be properly contained to prevent accidental spills from leaking into the surrounding environment.

B. Utilities

The Contractor shall provide telephone and sanitary facilities for his employees. Upon written approval of the Engineer, the Contractor may connect to existing plant electrical and water outlets, if not in use by the City, and if use of these utilities does not affect operation of the plant.

C. Employee Dress and Appearance

All Contractors, subcontractors, sales representatives, and their employees, shall be appropriately dressed. All workers and employees working at the plant shall wear shoes, pants, and shirts.

D. Unloading and Delivery of Materials and Equipment

The Contractor shall have adequate staff and equipment at the site to receive materials and

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equipment. City employees and City equipment shall not be used to assist the Contractor in receiving deliveries.

E. Use of City Facilities

Except as otherwise authorized in writing by the Engineer, the Contractor shall not use City telephones, restrooms, break rooms, or other facilities provided for City employees' comfort.

The Contractor shall not use the City's mailing address to receive mail. The City will not accept mail for the Contractor addressed to City offices or mail box.

F. Cleanup

Any waste or extra materials (including sandblast, rubble, brush, dirt, trash, sludge, packing crates, boxes, etc.), or equipment and materials replaced, will be the Contractor's responsibility for proper disposal. Disposal on-site or use of City dumpster may be allowed upon Contractor written request and upon receipt of written permission from the Engineer.

The Contractor shall do a thorough cleanup of the construction area daily.

All wire scraps, pipes, fittings, paper scraps, boxes, paint cans, scrap metal, and other scraps, shall be cleaned up daily. Metal scrap may be placed in the City's scrap metal dumpster located at the plant.

If the work is in an area of existing plant structures, the floors shall be swept clean and equipment that was soiled by the construction shall be dusted, on a daily basis.

Any damage to the existing plant facility, equipment, grass, landscaping, pavement, or surrounding structures, shall be restored to as good as or better condition by the Contractor as soon as the Contractor has completed work in the area of the damage, or as directed in writing by the Engineer.

G. Painting

1. All exposed interior and exterior pipes, conduits, and equipment shall be painted to protect the metal. The number of coats, mil thickness, etc., shall be as specified in the Technical Specifications or Plans or as directed by the Engineer.
2. Unless otherwise specified, finished coating on new or reconstructed Work shall be painted to match the existing color coding. The existing color coding may be obtained from the Engineer upon request.
3. No lead base paint, including primer, may be used. All paint systems shall have low Volatile Organic Compounds (VOCs).
4. All coatings that come in contact with drinking water shall comply with Florida Administrative Codes and be approved by the United States Environmental Protection Agency (EPA), the NSF International, the Underwriters Laboratories Inc. (UL), or other FDEP/EPA approving agency. This approval must be in writing and a copy of the approval

shall be submitted with the shop drawings.

5. Voids between beams, walls, tanks, slabs, and other steel or iron surfaces which would prohibit coating for rust protection must be sealed using an approved sealant.

H. Miscellaneous

1. The Contractor shall not assume that existing valves can be closed and drip-proof. After closing valves, the Contractor shall conduct adequate tests to determine the leakage of the valve and shall submit a procedure to the Engineer for handling this leakage during the shutdown period.
2. Unless otherwise specified, the Contractor shall restrict his scheduled hours of work to the period 7:00 a.m. to 4:00 p.m. weekdays. Work required to be performed during other periods of time should be shown on the Project Schedule. Emergency work required to be performed after hours shall be subject to approval by the Engineer.
3. Coordination of the Contractor's work that requires special procedures of the plant operating personnel shall be shown on the Project Schedule and shall be reconfirmed with the Engineer 48 hours prior to the required special procedure. The Engineer reserves the right to deny or reschedule work, if such action is needed due to operating demands, personnel availability, or other factors that will impact the City's use of the facility. The Engineer may grant a time extension to the Contract period if rescheduling impacts the completion time.

1.38 PLANT SECURITY

- A. The City's Water Resources Department conducts background checks of all workers at their treatment facilities. Before coming on site to work, the Contractor shall provide a list of the following:
 1. Full names of the employees assigned to be on-site.
 2. Social Security Number of each employee. Contractor shall inform all employees of the reason for providing social security numbers to the City in accordance with all applicable laws, rules, and regulations.
 3. Birth Date of each employee.
- B. The Water Resources Department project coordinator or designated representative will conduct a background check prior to allowing a worker on site. In order to allow time to conduct the background check, the Contractor shall supply this information at least 72 hours in advance of the worker coming to the site. Persons who meet one or more of the following criteria will fail the City's background check and will not be granted access to the City's wastewater treatment facilities:
 1. Listed on the FBI's list of suspected terrorists.
 2. Have an outstanding arrest warrant against them.
 3. Convicted of a First or Second Degree felony.
 4. Considered a habitual felony offender (after their 18th birthday convicted of two or more felony or 1st degree misdemeanors offenses within any 5-year period).
- C. The Contractor will be notified as to who passed the background check and will be allowed on site and who did not pass the background check and will not be allowed on site.

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- D. Contractors using “day laborers” shall provide the same information as above and with as much notice as possible. If the required information is given less than 72 hours in advance, the City will make its best effort to conduct these background checks in a timely manner. However, because of City staff’s other priorities, website problems, and/or computer problems, it may not be possible to complete the background checks in a timely manner. A worker arriving at the plant site who has not had a successful background check will have to wait outside the plant gate. Workers will not be permitted on site until they have passed the background check.

1.39 SALVAGED MATERIALS

The Contractor shall not proceed with demolition of existing materials or equipment without prior written approval from the Engineer for the method of disposal.

[Note 1: Revise the following wording as necessary to include only materials that are usable. Remember, the Contractor charges for salvaging and returning materials to the City yard.]

All materials which are not returned to the City yard shall be disposed in an approved disposal site. The Engineer may request confirmation of the site’s approval for disposal of the specific materials.

Salvaged materials shall be loaded on Contractor trucks and returned to the City Utilities Complex Yard, 1635 Third Avenue North. The City will designate the specific location at the yard for placement of salvaged materials by the Contractor.

The following materials shall be removed and returned by the Contractor:

- A. Fire hydrants, manhole frames and covers, inlet grates, and concrete catch basin covers shall be salvaged and each placed in a designated location at the City yard.
- B. Granite curb shall be salvaged, individually unloaded, and neatly placed at a designated location in the City yard.
- C. Red paving brick (free of asphalt) and sidewalk hexblock shall be palletized on City-furnished pallets and delivered to the City yard.
- D. Asphalt millings shall be transported to the City yard and dumped in a pile at a designated location in the City yard.

1.40 AS-BUILT DRAWINGS *[Note 1]*

A. General

For all elements of construction, the Contractor shall furnish the Engineer one set of marked-up Contract Plans blue-line prints showing as-built conditions, as specified in the *General Conditions* article headed "As-Built Drawings."

The drawings shall show the name, address, and phone number of the Contractor. Each drawing shall be certified by a responsible representative of the Contractor and dated.

The as-built drawings shall reflect any differences from the original Contract Plans in the same level of detail and units of dimension as the Plans.

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B. Stormwater Treatment Facilities *[Include if required for stormwater permitting]*

The stormwater permit for the Project requires certified as-built drawings to be submitted to the permitting agency. The Contractor shall prepare these as-built drawings in ink on black line mylar prints, using acceptable drafting standards. If requested by the Contractor, the City will furnish said blackline prints of the Contract Plans. The information shown/verified for the as-built drawings shall be as described below for "Storm Sewer Piping Systems."

The drawings for stormwater permit certifications shall include the full name, address, and phone number of the Contractor and Surveyor on the cover sheet of the as-built drawings.

The Contractor shall furnish the City with one set of as-built blackline mylar drawings and four sets of certified as-built blue-line prints made from the blackline mylars.

All drawings in the as-built set shall be labeled "As-Built" with date of completion noted, and shall be signed by a responsible representative of the Contractor. Four sets of the blue-line prints of as-built drawings prepared by the Contractor shall be certified by a Florida Registered Professional Land Surveyor. The 4 sets of certified drawings shall include Drawing No. _1 through ____ .

C. Potable Water and Reclaimed Water Distribution Systems *[Include paragraphs marked with *** for pipe larger than 12-inch.]*

Pipeline 2-inch and larger shall be dimensioned to the face of the curb or other approved landmark. If the Work is done prior to the installation of curbs, the dimensions may be taken from known property lines.

All valves, hydrants, fittings, meters, taps, thrust blocks, harnessed joint pipe, and all other appurtenances shall be shown on intersection drawing sketches and on the as-built drawings. Pipe material shall also be shown.

Stations and elevations shall be shown for pipeline 6-inch and larger for all horizontal and vertical changes in the pipeline alignment or grade. Valves, outlets, fittings, and other appurtenances shall be stationed.

*** All elevations shown shall be verified or corrected. Additional elevations shall be added as required.

*** Casing pipe, polyethylene wrap, concrete encasement, and other areas of special construction shall also be defined.

Intersection drawings shall be sketched at a scale of one inch equals 30 feet and submitted on 8-1/2-inch by 11-inch paper sheets with the Contractor's monthly request for partial payment, or prior to placing the pipeline into service, whichever occurs first. A typical intersection drawing example may be requested from the Engineer.

C. Sanitary and Storm Sewer Piping Systems

Manholes, inlets, headwalls and other drainage structures shall be dimensioned from the face of curb or roadway centerline, or construction baseline, and stationed along the baseline. New service connections and replaced service connections shall be dimensioned to the nearest downstream manhole.

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All dimensions shown on the Plans shall be verified. All manhole, inlet and other drainage structure top and invert elevations shall be recorded. Top elevations for manholes shall be the north rim elevation. Inlets shall have recorded curb type, curb top, and gutter elevations. Invert elevations, direction, and size shall be recorded for every pipe/culvert connecting to a structure (including conflict pipes). All drainage structure inside dimensions shall be recorded. Special structures such as headwalls/endwalls and weir/control boxes shall have recorded all pipe/culvert invert elevations, direction, and size as well as flow lines for weirs and dimensions of oil skimmers and other devices.

All pipe materials shall be recorded, and all areas of special construction shall be noted.

D. Paving

The as-built drawings shall show all changes to the horizontal and vertical alignment in the plan, profile, and cross sections. Drawings shall indicate changes in elevations for curbs and roadway crowns, base type and thickness, curb type, limits of new sidewalk, driveway replacement (including paving materials used), and other surface features.

E. Bridge

The as-built drawings shall reflect any change or deviation from the original Contract Plans, to include but not necessarily be limited to, pavement cross-section, elevations of pier footers, bearing pads, and bridge deck approach slabs.

F. Electrical and Control Wiring

The as-built drawings shall include all changes to the original Contract Plans. The as-built drawings shall also include the size, color, and number of wires and conduit. For Projects where this information is too voluminous to be contained on the blue-line prints, the Contractor shall prepare supplemental drawings, on same size sheets as the blue-line prints, showing the additional conduit runs, 1-line diagrams, ladder diagrams, and other information. The wiring schematic diagrams shall show termination location and wiring identification at each point on the ladder diagram.

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SECTION 2 - EXCAVATION AND BACKFILL

2.01 GENERAL

The Work in this section includes furnishing all labor, materials, tools, and equipment for excavation and backfill of roadways, sidewalks, curbs, driveways, pipelines, and structures. The Work also includes removing and disposing of leftover material, and furnishing and placing off-site fill.

Bidders shall examine the site of the Work, make their own additional soil borings and tests, and make their own determination of the character of materials and the conditions to be encountered on the Work; their Proposal shall be based upon their own investigation.

Standards referenced in this section are the latest revision of the following specifications:

AASHTO T 99	"Method of Test for Moisture-Density Relations of Soils Using a 2.5-Kg (5.5-lb) Rammer and a 305-mm (12-14) Drop"
AASHTO T 180	"Method of Test for Moisture-Density Relations of Soils Using a 4.54-Kg (10-lb) Rammer and a 457-mm (18-in) Drop"
ASTM C 33	"Specification for Concrete Aggregates"
ASTM D 1557	"Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort"
DOT-SSRBC Section 110	"Clearing and Grubbing"
DOT-SSRBC Section 120	"Excavation and Embankment"
DOT-SSRBC Section 901	"Coarse Aggregate"
DOT-SSRBC Section 902	"Fine Aggregate"
DOT-SSRBC Section 921	"Portland Cement and Blended Cement"
DOT-SSRBC Section 923	"Water for Concrete"
DOT-SSRBC Section 929	"Fly Ash, Slag, Microsilica and Other Pozzolanic Materials for Portland Cement Concrete"
FS 90-96	Florida Trench Safety Act Statute
29 C.R.R., S. 1929.650 Subpart P	OSHA Trench Excavation Safety Standard

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2.02 TRENCH SAFETY

The Contractor shall be responsible for maintaining safety at each excavation. The Contractor shall adhere to the Florida Trench Safety Act (FS 90-96), OSHA trench excavation safety standards (29 CFR, Subpart P, 1926.650), and OSHA trench excavation shielding, sloping, or sheeting requirements. Inspections required by OSHA trench excavation safety standards shall be provided by the Contractor's "competent person," as defined by OSHA 29 CF, Subpart P, 1926. The Contractor's "competent person" shall be identified at the Project preconstruction meeting.

The Contractor certifies by submitting the bid and subsequently executing this Contract, that all trench excavation done within his control shall be accomplished in strict adherence with OSHA trench safety standards, the Florida Trench Safety Act, and public safety.

The Contractor also agrees to produce or obtain, prior to award of the subcontracts, identical certification from subcontractors who will perform trench excavation, and to retain such certification for at least 3 years following Final Acceptance.

The Contractor shall consider all available geotechnical information when designing the trench excavation safety system. If sufficient geotechnical information is not available, the Contractor may obtain such to support the requirements set forth above, at no additional cost to the City.

2.03 WORK IN WETLANDS, MANGROVES, AND PRESERVATION AREAS

Strict adherence to all permits is required. Damage to wetlands, periodically wet areas, mangroves, and preservation areas is prohibited. Any such damage by the Contractor shall be duly rectified at no additional cost to the City and as approved by the regulatory agencies.

2.04 CLEARING AND GRUBBING

All clearing and grubbing Work shall conform to all applicable requirements of DOT-SSRBC Section 110 "Clearing and Grubbing" except as modified herein.

The Contractor shall remove only those trees and bushes necessary to complete the specified Work. Not all the trees and bushes have been located or shown on the Plans. The Contractor shall flag those trees and bushes to be removed. All other trees and bushes shall be protected as specified in Technical Specifications section headed "General," subsection headed "Tree Protection."

All roots, stumps, and other debris shall be removed to a depth not less than 12 inches below a bearing surface. The disturbed surface shall be backfilled, graded, and compacted as specified.

No tree or bush shall be removed without the approval of the Engineer. The Contractor shall obtain all necessary City or County permits for each tree to be removed. Tree removal shall conform to the provisions of the Technical Specifications section headed "General," subsection headed "Tree Removal and Replacement."

2.05 ROADWAY EXCAVATION

The extent of excavation shall be as shown on the Plans or otherwise approved by the City, and shall include roadway excavation and/or filling and grading, together with the removal of trees, bushes, existing asphalt, concrete, or other material, as required to facilitate construction and restoration as directed by the City.

All excavation Work shall conform to all applicable requirements of DOT-SSRBC Section 120 except as modified herein.

2.06 TRENCH EXCAVATION

Mechanical excavation shall be terminated at least 2 inches above the proposed pipe bed and trench bottom, then shaped and compacted so as to provide uniform bearing on the barrel of the pipe. Particular care shall be taken to recess the bottom of the trench at the bell of the pipe to relieve the bell of all load.

A minimum trench width shall be maintained, allowing room for the jointing and proper compaction of the backfill. If material is encountered that is unsuitable in the opinion of the Engineer, it shall be removed by the Contractor and replaced with acceptable material compacted in place as specified. In the event the Contractor excavates below the elevation required without approval, the Contractor shall backfill with approved materials compacted to obtain a suitable trench bottom, all to the satisfaction of the Engineer and at no additional cost to the City.

The amount of open trench shall be limited so that no more than 100 feet of open trench in advance of the backfilling operation will remain at the end of that working day. All open trench shall be protected by the Contractor with barriers, warning devices, and traffic control devices, which shall be kept in the correct position, properly directed, anchored when required, and clearly visible at all times. The barriers, warning devices, and traffic control devices shall be suitably lighted at all times when vehicular traffic lights are required.

2.07 STRUCTURE EXCAVATION

Excavation shall be of the size and depth required for construction of structures and their foundations. Unsuitable material encountered shall be removed to the depth required to obtain sound foundation material or as ordered by the Engineer. Over-excavated areas shall be filled with approved backfill material compacted as specified, at no additional cost to the City.

Unsuitable existing soil shall be removed and replaced with compacted material, as approved by the Engineer and as specified in the subsection herein headed "Excavation of Unsuitable Material."

2.08 EXCAVATION OF UNSUITABLE MATERIAL

Unsuitable material shall include rock, concrete, and boulders. Unsuitable soft material shall include logs, muck, other soft soils, organic soils, and other soils as specified or as ordered by the Engineer to be unsuitable.

All excavation of unsuitable material shall conform to all applicable requirements of DOT-SSRBC Section 120 except as modified herein.

Unsuitable material encountered below or within the roadway stabilized subgrade, the trench bottom, or a structure bottom, shall be removed by the Contractor to the limits established by the Engineer and disposed of from the Work area at an approved disposal area. Unsuitable material shall be replaced with approved material and compacted as specified.

No additional payment will be made for backfill material obtained from any source and used to replace any unsuitable material except as otherwise specified. Limerock shall not be used as backfill material.

2.09 SHEETING, SHIELDING, AND SLOPING

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All excavations shall be properly sheeted, shielded, or sloped to the required slope to furnish safe working conditions, to prevent shifting of material, to prevent damage to structures or other Work, and to avoid delay to the Work, all in accordance with applicable safety and health regulations. The minimum sheeting and shielding for trench excavations shall meet the general trenching requirements of the Florida Trench Safety Act and OSHA standards.

The sheeting and shielding shall be of adequate strength and quantity for the purpose intended. Any sheeting extending below the level of above the top of pipeline shall be cut off as ordered by the Engineer and left in place. In addition, the Engineer may order the Contractor to cut off and leave in place any sheeting, shielding, or other approved support where required to protect construction, property, or existing facilities or utilities.

Damages resulting in the installation or removal of sheet piling shall be rectified by the Contractor at no additional cost to the City.

2.10 DEWATERING

All pipeline and appurtenances shall be laid entirely in a dry trench. All foundations and structure walls shall be constructed or installed in a dry excavation.

Before commencing any excavation at the site of the Work, the Contractor shall submit to the Engineer for review, the methods, equipment, and arrangement of facilities proposed for dewatering and disposal of water at the site and of all water entering any excavation or other part of the Work from any source whatsoever.

Water discharged from dewatering equipment shall be carried into surface drainage facilities, except water quality treatment systems, and shall not be discharged into sanitary sewer lines. The Contractor shall prevent water from puddling in streets or on private properties. The depositing of dirt in storm drains or ditches, and the staining of existing facilities, are not allowed.

Adequate standby facilities shall be provided to ensure that the excavation will be kept dry in the event of power failure or mechanical breakdown. Facilities for the removal and disposal of water shall be of sufficient capacity to keep the excavation dry under all circumstances with one-half of the facilities out of service. If well points are used, provision shall be made for removing and resetting individual well points without taking the system of which they are a part out of service.

The City reserves the right to require the Contractor to replace noisy equipment in order to keep disturbance to a minimum.

The cost of dewatering and disposal of water shall be included in the unit quantity for each appropriate item bid.

Refer to the Technical Specifications Section headed "General," subsection headed "Contaminants Containment/Disposition," for requirements concerning encountered groundwater contaminants.

2.11 BORROW MATERIAL

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Any borrow excavation Work shall consist of the excavation and satisfactory utilization of material from areas provided by the Contractor when necessary material is not available from the normal excavation or grading operations. This Work shall conform to DOT-SSRBC Section 120 except as modified herein.

If additional fill material is required, it shall be City approved material supplied and compacted by the Contractor. All compaction under roadway, alley, driveway, curb, walk, or other improved surface shall be to a density as specified. Unless otherwise directed by the City, all material not required for construction shall be removed from the premises and disposed of by the Contractor.

2.12 BEDDING MATERIAL

Where shown, ordered, or required, the Contractor shall place bedding material prior to placing pipelines, structures, or slabs. Bedding material may be either excavated approved native sand, concrete sand, gravel, or reclaimed concrete. Limerock is not allowed.

Off-site bedding material shall be sand or gravel. Sand bedding material shall be a clean concrete sand of uniform gradation between sieve sizes No. 4 and No. 50. All particles shall pass a 3/8-inch sieve and no particles shall pass a No. 100 sieve.

Gravel bedding material shall meet the requirements of ASTM C33 and shall be coarse aggregate, DOT Size No. 67 (3/4-inch to No. 4) or approved equal.

Reclaimed concrete bedding material shall be graded to meet the size requirements as specified for gravel bedding.

Bedding material, where required, shall be placed in lifts and compacted in a manner to achieve the specified density as described elsewhere.

If gravel or reclaimed concrete bedding is used, an impermeable groundwater barrier shall be placed at 100-foot intervals.

The impermeable groundwater barrier shall consist of a 10 mil sheet of polyethylene covering the full cross sectional area of the gravel, embedded 6 inches into the trench sides and bottom, and extending to the top of the bedding. The barrier shall be offset a minimum of 2 feet from any culvert or pipe joint. Ends and splice points shall be lapped a minimum of 12 inches.

2.13 STRUCTURAL SLAB BEDDING

Structural slabs for manhole bases, footings, and similar structures shall be placed on approved compacted bedding material and leveled as specified and/or as shown.

2.14 BACKFILL COMPACTION

All backfill shall be compacted as specified herein and shall meet the following minimum density as determined by the AASHTO T-180 method for backfill outside the right-of-way and in City streets, and by the AASHTO T-99 method if in County or State right-of-way.

AASHTO T-180 Method C or D will be used for stabilized subgrade and base compaction tests, and Method A or B will be used for backfill testing, or as directed by the Engineer or jurisdiction.

Technical Specifications
Section 2 - Excavation and Backfill

Project No.

	T-180	T-99
Roadway stabilized subgrade	98%	N/A*
Roadway base	98%	N/A*
Curb base	98%	N/A
Sidewalk and driveway base	98%	N/A
Pipe bedding	98%	100%
Pipe backfill - under pavement	98%	100%
Pipe backfill - under grass	95%	100%
Structure base slabs	100%	N/A
Structure backfill	98%	N/A

*Roadway stabilized subgrade and base material shall meet LBR requirements as specified in the Technical Specifications section headed "Roadway Construction," subsections headed "Stabilized Subgrade" and "Roadway Base."

Moisture content of backfill material shall be controlled in order that compaction occurs when the material is within +/- 2 percent of optimum as developed by the Modified Proctor moisture-density relationship set forth in ASTM D-1557. To control the moisture content, the Contractor shall mechanically rework or aerate the backfill material as necessary prior to compaction.

2.15 BACKFILLING OF TRENCH

Backfilling shall be accomplished with suitable material, and shall commence only after the pipelines have been laid and tentatively accepted by the City. The space between the pipe and the sides of the trench shall be packed full by hand-shoveled earth free from lumps or debris.

The backfill material shall be placed in 6-inch lifts and compacted, using approved tampers to the required compaction, to a point 12 inches over the top of the pipe. The remaining backfill (under areas other than roadways) shall be placed in uniform lifts not greater than 12 inches thick (or less as approved for mechanical equipment available) and tamped to the required compaction. Backfill under roadways shall be compacted in 6-inch lifts.

2.16 BACKFILLING STRUCTURES

Backfill around structures shall be of suitable job-excavated material, suitable off-site fill material, or other material approved by the Engineer. Such backfill shall extend from the bottom of the excavation or top of bedding to the bottom of pavement base course, the bottom of lawns or lawn replacement, the top of the existing ground surface, or to such other grades as may be shown or required.

The backfill shall be placed in uniform lifts not greater than 12 inches thick, and thoroughly compacted in place.

2.17 BACKFILLING UNDER ROADWAYS

Backfill placed under roadways and other paved surfaces shall be compacted in 6-inch lifts and thoroughly compacted in place, with suitable equipment as specified herein.

2.18 DISPOSING OF LEFTOVER MATERIAL

The Contractor shall bring the surface to the same level as existed prior to the excavation. All leftover material shall be hauled from the site and disposed of by the Contractor. Leftover material

shall not be stored in or along rights-of-way or easements.

2.19 ADJACENT FACILITIES

The Contractor shall be responsible for the protection, removal, and replacement of all adjacent structures, utilities, trees, shrubbery, curbs, culverts, headwalls, fences, City-maintained signs, and other miscellaneous City-maintained structures encountered during the course of the Work.

2.20 TEMPORARY SUPPORTS

Temporary supports for 16-inch and larger pressure and gravity pipes shall be designed by the Contractor and submitted to the City as required by the *Contract Standards: General Conditions* section headed "Shop Drawings and Submittals." Temporary supports that include a structural beam, or other such member(s), shall be designed, signed and sealed by a Professional Engineer.

2.21 FLOWABLE FILL

Where shown on the Plans, or where ordered by the Engineer, the Contractor shall backfill a void area or an excavation with flowable fill. Flowable fill may be shown, or ordered, to fill abandoned pipes, abandoned underground steel storage tanks, trench backfill, washout area under structural slabs or behind walls, or other similar locations.

Flowable fill shall be produced and delivered to the site. Placing of flowable fill shall be by chute, pumping, or other approved methods. Flowable fill shall be placed to the designated fill line without vibration. The Contractor shall take all necessary precautions to prevent any damage caused by hydraulic pressure of the fill during placement prior to hardening. Flowable fill shall not be used for pipe bedding and backfill in the zone from the bottom of a pipe to 12 inches above the top of pipe.

Flowable fill shall consist of materials conforming to DOT-SSRBC Sections as follows:

Cement (Type I or II)	Section 921	"Portland Cement and Blended Cement"
Fly ash (Type F)	Section 929	"Fly Ash, Slag, Microsilica and Other Pozzolanic Materials for Portland Cement Concrete"
Fine aggregate (sand)	Section 902	"Fine Aggregate"
Water	Section 923	"Water for Concrete"

The Contractor shall submit a proposed flowable fill design mix that will produce a flowable fill meeting the strength requirements specified herein, using the following materials:

	Pounds per cubic yard
Cement (Type I or II)	50 - 200
Fly ash (Type F)	0 - 2,000
Fine aggregate (sand)	2,500 - 3,000
Water	325 - 550

Note: 6-inch to 10-inch slump

Flowable fill material shall be proportioned to produce a 28-day compressive strength approximately as follows:

	Pounds per square inch
Pipe trench backfill	50 - 150
Fill abandoned pipes or tanks	30 - 150

SECTION 3 - CONCRETE, MASONRY, AND REINFORCING STEEL

3.01 GENERAL

The Work in this section includes furnishing, placing, finishing, and curing all reinforced and plain concrete, pre-stressed concrete, reinforcing steel, welded wire fabric, brick, masonry block, mortar, and related work. Brick used for paving and hexagon block used for sidewalks are not included in this section.

3.02 PORTLAND CEMENT CONCRETE

Portland cement concrete shall conform to the applicable requirements of the DOT-SSRBC Sections 346, 347, and 921.

Class IV concrete shall be used for all concrete in contact with, or over, salt or brackish water.

Concrete used for structures in contact with sewage shall be mixed from Type II Portland cement containing the lowest calcium thiosulfate available as specified in AASHTO M 85.

Concrete shall meet the following minimum 28-day compressive strength:

Miscellaneous concrete (thrust blocks, pipe encasement, etc.)	2,500 psi
Concrete curb/gutter/sidewalk/pavement	3,000 psi
Cast-in-place/precast structures	4,000 psi
Pre-stressed structures	5,000 psi

3.03 REINFORCING STEEL

Reinforcing steel shall conform to ASTM A 615, Grade 60 deformed bars and to the applicable requirements of DOT-SSRBC Sections 415 and 931.

Reinforcing steel shall not be coated, except as specifically specified on the Plans.

All welded wire fabric shall conform to ASTM A 497 (deformed) or ASTM A 185 (plain) and to the applicable requirements of DOT-SSRBC Article 415-6.

3.04 FIBROUS CONCRETE REINFORCEMENT

Fibrous concrete reinforcement may be used, where shown or approved, in lieu of welded wire fabric for shrinkage and thermal contraction/expansion in concrete pavement, driveway, and sidewalk.

Fibrous concrete reinforcement shall conform to ASTM C 1116, ASTM C 94, and ASTM E 119-83.

Fibrous concrete reinforcement shall be 100 percent virgin polypropylene fibrillated material mixed with concrete at a minimum of 1.5 pounds per cubic yard of concrete.

Technical Specifications
Section 3 - Concrete, Masonry, & Reinforcing Steel

Project No.

3.05 PLACEMENT OF REINFORCEMENT

Reinforcing steel placement shall conform to the applicable requirements of DOT-SSRBC Articles 350-7 and 415-5.

The following minimum concrete cover shall be provided for all reinforcement:

Concrete cast against and permanently exposed to earth	3-inch
Concrete exposed to earth or weather	
Primary reinforcement	2-inch
Stirrups, ties, and spirals	1 1/2-inch
Concrete deck slabs, top and bottom	2-inch
Concrete not exposed to earth or weather	
Primary reinforcement	1 1/2-inch
Stirrups, ties, and spirals	1-inch

For bundled bars, the minimum concrete cover shall be equal to the equivalent diameter of the bundle, but need not be greater than 2-inch, except against and permanently exposed to earth, in which case the minimum cover shall be 3-inch.

Minimum concrete cover shall be increased in corrosive environment areas.

3.06 PLACEMENT OF CONCRETE

Placement of Portland cement concrete shall conform to the applicable requirements of DOT-SSRBC Article 400-7.

Unless specific permission is granted prior to each occurrence, no concrete shall be delivered to the job site before 7:30 a.m. or after 4:30 p.m.

No concrete shall be placed until the reinforcing steel placement has been inspected and approved by the Engineer.

3.07 CURING OF CONCRETE

Curing of Portland cement concrete shall conform to the applicable requirements of DOT-SSRBC Article 520-8.

3.08 FINISHING OF CONCRETE

Finishing of Portland cement concrete shall conform to the applicable requirements of DOT-SSRBC Article 400-15.

3.09 CONCRETE BRICK

Concrete brick for use in drainage structures and where shown on the Plans shall be approximately 3 5/8-inch by 7 5/8-inch by 2 1/4-inch in size and shall conform to ASTM C 55, Grade N-II or S-II.

3.10 CLAY BRICK

Brick shall be sound, hard, and uniformly burned regular and uniform in shape and size or compact texture and conforming to ASTM C 32, "Specification for Sewer and Manhole Brick (Made from Clay or Shale) Grade MS or MM."

3.11 MASONRY BLOCK

Load bearing units shall be hollow or solid, as shown on the Plans, and shall conform to ASTM C 90, Type I, 8-inch by 16-inch or 4-inch by 16-inch nominal face dimension.

Non-load bearing units shall conform to ASTM C 129, Type I, 8-inch by 16-inch or 4-inch by 16-inch nominal face dimension.

Horizontal continuous joint reinforcement shall be provided at every other joint. Reinforcement shall be a minimum of #9 gage steel, Grade 50. Wire shall be hot-dip galvanized, conforming to ASTM A 153, Class B-2 (1.5 ounce per square foot of wire surface) for zinc coating after prefabrication into units. Mortar coverage shall be not less than 5/8-inch on joint faces exposed to exterior, and not less than 1/2-inch elsewhere.

3.12 MORTAR

Mortar shall consist of a mixture of cementitious materials, aggregate, and water. All proportions shall be by volume and/or weight. Masonry cement shall conform to ASTM C 91 and C 270. Fine aggregate and Portland cement shall conform to the applicable requirements of DOT-SSRBC Sections 902 and 921 respectively.

Mortar shall have a minimum compressive strength of 1,500 psi.

3.13 GROUT

Grout shall be identical to mortar in all respects.

Technical Specifications
Section 3 - Concrete, Masonry, & Reinforcing Steel

Project No.

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SECTION 4 - PIPING MATERIALS: DUCTILE IRON PIPE

4.01 GENERAL

The Work in this section includes furnishing all ductile iron pipe, fittings, joints, and appurtenant materials. All castings furnished shall have been cast in the United States of America unless complete certification is furnished in accordance with the latest edition of ANSI/AWWA C 110.

Standards referenced in this section are the latest revision of the following specifications:

ANSI/AWWA C104	"Cement Mortar Lining for Ductile-Iron Pipe and Fittings for Water"
ANSI/AWWA C110	"Ductile-Iron and Gray Iron Fittings, 3-Inch through 48-Inch, for Water and Other Liquids"
ANSI/AWWA C111	"Rubber Gasket Joints for Ductile-Iron and Pressure Pipe and Fittings"
ANSI/AWWA C115	"Flanged Ductile Iron Pipe with Threaded Flanges"
ANSI/AWWA C150	"Thickness Design of Ductile-Iron Pipe"
ANSI/AWWA C151	"Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids"
ANSI/AWWA C153	"Ductile-Iron Compact Fittings, 3-Inch through 24-Inch, for Water and Other Liquids"
ASTM D 1248	"Polyethylene Plastics Molding and Extrusion Materials"

4.02 PIPE

A. General

All ductile iron pipe shall be designed in accordance with ANSI/AWWA C150. Pipe shall be minimum pressure class as follows:

Size	Pressure Class
3-inch through 18-inch	350
20-inch through 24-inch	300
30-inch through 48-inch	200

For threaded flanged pipe the minimum thickness shall be the nominal thickness as shown on Table 15.1 of ANSI/AWWA C115.

Thickness shall be designed for Laying Condition Type 2: Flat bottom trench backfill lightly consolidated to centerline of pipe.

Pipe shall be manufactured in accordance with ANSI/AWWA C151.

The pressure rating, metal thickness class, net weight of pipe (without lining) length of pipe, name of manufacturer, "DI" or "DUCTILE," and country where cast, shall be clearly marked on each length of pipe.

Technical Specifications
Section 4 - Piping Materials: DIP

Project No.
B. Lining

1. **Potable Water Lines and Reclaimed Water Lines:** Ductile iron pipe and fittings for use in potable and reclaimed water lines shall be cement mortar lined. Cement lining shall conform to ANSI/AWWA C104, and seal coated with approved bituminous seal coat in accordance with ANSI/AWWA C151. Seal coating shall be UL listed or NSF approved for use in potable water mains.
2. **Sanitary Force Mains and Gravity Sanitary Pipe:** Ductile iron pipe and fittings for sanitary sewer force mains and gravity sewer pipe shall be polyethylene, polyurethane, or epoxy lined.

Epoxy lining shall be 40 mil minimum thickness (multi-pass process) and shall be Protecto 401 Ceramic Epoxy, as manufactured by the Protecto Division of Vulcan Painters, Inc., or approved equal.

Polyethylene lining shall be factory furnished with a fusion bonded polyethylene liner of 60 mil minimum thickness conforming to ASTM D1248, such as Polybond Plus as furnished by American Cast Iron Pipe Co, or approved equal.

Polyurethane lining shall be factory applied conforming to Corropipe, as manufactured by Madison Chemical Industries, Inc., or an approved equal. Material shall be applied in conformance with the manufacturer's recommendation and shall be a 40 mil final dry film thickness.

3. **Storm Drain Gravity Pipe:** Ductile iron pipe and fittings for storm drain gravity pipe shall be epoxy lined as per sanitary pipe or cement mortar lined as per water pipe, at the Contractor's option.

4.03 FITTINGS

Ductile iron fittings shall conform to ANSI/AWWA C110 or ANSI/AWWA C153.

Fittings shall be suitable for a minimum water pressure plus water hammer as follows:

Size	Type	Pressure Rating
3-inch through 12-inch	CI	250
3-inch through 12-inch	DI	350
14-inch through 24-inch	DI	350
30-inch through 48-inch	DI	250

Fittings shall be coated outside with petroleum asphaltic coating, 1 mil minimum thickness.

Fittings shall be lined as specified herein headed "4.02 Pipe."

Anchor couplings equal to McWayne Clow F-1211 for fire hydrant assemblies may be substituted with an anchoring tee equal to Catalog No. A-10180 locked hydrant tee as manufactured by American Ductile Iron Pipe Co. or hydrant tee with rotatable MJ gland as manufactured by U.S. Pipe Co. in place of the MJ tee and anchor coupling as shown, at the Contractor's option.

4.04 JOINTS - BURIED PIPE AND FITTINGS

Project No.

Joints for ductile iron pipe and fittings shall conform to ANSI/AWWA C111, except as otherwise specified. All pipe and fittings shall be furnished complete with joint accessories necessary for installation conforming to ANSI/AWWA C111. No additional payment will be made for joint accessories, including retainer glands, unless otherwise specified.

The Contractor shall furnish and install all necessary materials, equipment, and appurtenances required to complete the work.

- A. **Unrestrained Joints:** Joints for unrestrained pipe shall be push-on joint. Joints for fittings, when installed with unrestrained pipe, shall be mechanical joint with DI retainer glands, as specified herein for restrained joints.
- B. **Restrained Joints:** All joints in restrained pipe systems shall be of the same type (pipe and fittings), except valves shall be mechanical joint with DI retainer glands as specified.
 - 1. **12-inch and Smaller:** Joints for restrained pipe and fittings, 12-inch and smaller, shall be one of the following:
 - a. Push-on restrained joint utilizing a retainer ring, equal to U.S. Pipe TR Flex. It shall be UL listed, FM approved, or shall be certified by an approved laboratory that the restrained joint will not separate at the specified test pressure.
 - b. Push-on restrained joint using a locking type gasket, equal to Field-Lok, as manufactured by U.S. Pipe and Foundry, Inc. It shall be UL listed, FM approved, or shall be certified by an approved laboratory that the restrained joint will not separate at the specified test pressure.
 - c. Mechanical joint with DI retainer glands shall be furnished with retainer glands equal to Series 1100 Megalug, as manufactured by EBAA Iron Inc., Stargrip 3000 as manufactured by Star Pipe Products, or DI MJ Gripper Gland as manufactured by U.S. Pipe and Foundry Co. for use with ductile iron pipe. All retainer glands shall be UL listed, FM approved, or shall be certified for 350 psi pressure rating with a 2:1 safety factor.
 - 4. **Larger than 12-inch:** Joints for restrained pipe and fittings larger than 12-inch shall be as follows:
 - a. Restrained pipe joints shall be modified push-on restrained joint, equal to U.S. Pipe TR Flex, and shall be UL listed or FM approved.
 - b. Fittings joints shall be equal to U.S. Pipe TR Flex or shall be mechanical joint with DI retainer glands. Retainer glands shall be equal to Series 1100 Megalug or Stargrip 3000 for 16-inch and larger pipe. All retainer glands shall be UL listed, FM approved, or certified for 350 psi pressure rating (for 16-inch) and 250 psi pressure rating (for larger than 16-inch) with a 2:1 safety factor.
 - c. Valve joints shall be mechanical joint with DI retainer glands as specified herein for larger than 12-inch fittings joints.

4.05 JOINTS - EXPOSED PIPE AND FITTINGS

Technical Specifications
Section 4 - Piping Materials: DIP

Project No.

Joints for exposed ductile iron pipe and fittings shall be restrained, except as otherwise noted on the Plans. Joints for exposed pipe in plants and in vaults shall be flanged where noted on the Plans.

Joints for exposed pipe and fittings 12-inch and smaller shall be modified push-on restrained joint using a retainer ring, or modified push-on joint using a locking type gasket, as specified herein headed "4.04 Joints - Buried Pipe and Fittings."

Joints for exposed pipe and fittings larger than 12-inch shall be modified push-on restrained joint using a retainer ring as specified.

SECTION 5 - PIPING MATERIALS: CONCRETE GRAVITY PIPE

5.01 GENERAL

The Work in this section includes furnishing concrete gravity pipe for storm drain pipelines, including:

Reinforced Concrete Pipe (RCP)
Fiber Reinforced Concrete Pipe (FRCP)
Elliptical Reinforced Concrete Pipe (ERCP)

Equivalent sized round FRCP meeting the requirements of this section will be deemed an acceptable alternative to round RCP of the same class when used in locations not under or within 10 feet of public roadway pavement and/or curb. FRCP may be used in parking lots and green space areas.

Standards referenced in this section are the latest revision of the following specifications:

ASTM C 76	"Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe"
ASTM C 361	"Specification for Reinforced Concrete Low-Head Pressure Pipe"
ASTM C 443	"Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets"
ASTM C 507	"Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe"
ASTM C 877	"Specification for External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections"
ASTM 1450	"Specification for Non-Asbestos Fiber-Cement Storm Drain Pipe"
DOT-SSRBC Section 346	"Portland Cement Concrete"
DOT-SSRBC Section 449	"Precast Concrete Drainage Products"
DOT-SSRBC Sections 942	"Pipe Gaskets"

5.02 PIPE

Pipe shall be manufactured in laying lengths of not more than 16 feet and not less than 7.5 feet, except where approved by the Engineer or required at structures.

Pipe shall meet applicable provisions of DOT-SSRBC Sections 449.

Type II cement shall be used for RCP unless an alternative is specifically approved by the Engineer.

Technical Specifications
Section 5 - Piping Materials: Concrete Gravity Pipe

Project No.

Round RCP shall conform to applicable requirements of ASTM C 76. Pipe installed with less than 12 feet of cover shall be Class III, Wall B or C; pipe installed at depth of 12 feet to 16 feet shall be Class IV, Wall B or C; pipe installed at depth greater than 16 feet shall be Class V, Wall C; all unless otherwise shown or specified.

FRCP shall conform to the applicable requirements of ASTM 1450 and the modifications to ASTM 1450 as set forth in DOT-SSRBC Section 449-5 and as modified herein. Any indication whatsoever of delamination, separation of the pipe wall layers, impact damage, or breakage (whether before, during, or after placement of the FRCP in the trench) will be immediate cause for rejection and replacement of the pipe segment or segments. Pipe installed with less than 12 feet of cover shall be Class III; pipe installed at depth of 12 to 16 feet shall be Class IV; pipe installed at depth greater than 16 feet shall be Class V; all unless otherwise specified.

ERCP shall conform to applicable requirements of ASTM C 507, Table 1, Class HE-III, unless a different pipe class is listed on the Plans or in the Proposal.
Pipe shall not be coated.

5.03 JOINTS

Joints for round RCP and FRCP shall be sealed with an internal rubber gasket which shall conform to the applicable provisions of ASTM C 361 Article 6.9, ASTM C 443, and DOT-SSRBC Sections 449 and 942.

Joints for ERCP shall be sealed with an internal cold adhesive preformed plastic gasket material which shall conform to DOT-SSRBC Section 942 or with a continuous rubber gasket type, equal to Oval Ultra Seal as manufactured by Hanson (formerly Joelson) Concrete Pipe Co., Inc.

All pipe joints, whether for round or elliptical pipe, shall be wrapped with an external joint wrap: Mirafi 140-N as manufactured by Mirafi, Inc. or approved equal, or with an external pipe joint sealing band conforming to ASTM C 877 Type I as manufactured by Upper Peninsula Rubber Company, Inc. or equal.

SECTION 6 - PIPING MATERIALS: PVC PRESSURE PIPE

6.01 GENERAL

The Work in this section includes furnishing all Polyvinyl Chloride (PVC) pressure pipe and fittings. PVC pressure pipe includes all PVC pressure pipe 2-inch through 36-inch.

Standards referenced in this Section are the latest revision of the following specifications:

ANSI/AWWA C900	"Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4-Inch through 12-Inch, for Water Distribution"
ANSI/AWWA C905	"Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings 14-Inch through 48-Inch, for Water Transmission and Distribution"
ANSI/AWWA C110	"Ductile-Iron and Gray-Iron Fittings, 3-Inch through 48-Inch for Water"
ANSI/AWWA C111	"Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings"
ANSI/AWWA C153	"Ductile-Iron and Gray-Iron Fittings, 3-Inch through 48-Inch for Water"
ASTM D 1784	"Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds"
ASTM D 1785	"Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120"
ASTM D 2241	"Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)"
ASTM D 3139	"Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals"

6.02 PIPE

- A. **Two-inch Pipes:** All 2-inch PVC pipe shall meet ASTM D 1784 specification for rigid PVC compounds and ASTM D 2241 specification for PVC plastic pipe. PVC pipe shall be suitable for use at maximum hydrostatic working pressure of 160 psi at 73°F. Pipe shall have a standard dimension ratio (SDR) 26 and bear the NSF Seal for potable water pipe.
- B. **Four-inch Through 12-inch Pipes:** PVC pressure pipe 4-inch through 12-inch shall meet the requirements of ANSI/AWWA C900, with outside diameter dimensions of ductile iron pipe. All 4-inch through 12-inch PVC pressure pipe shall be Class 150 and DR18 with a pressure rating of 188 psi.

Technical Specifications

Section 6 - Piping Materials: PVC Pressure Pipe

Project No.

- C. **14-inch Through 36-inch Pipes:** PVC pressure pipe 14-inch through 36-inch shall meet the requirements of ANSI/AWWA C905, with outside diameter dimensions of ductile iron pipe. All 14-inch through 36-inch PVC pressure pipe shall be Class 100 and DR25 with a pressure rating of 133 psi.
- D. **UV Resistant PVC Pipe:** All PVC piping exposed to sunlight shall contain titanium dioxide for UV resistance, and shall conform to ASTM D 1784 and ASTM D 1785 (IPS). The Contractor shall submit the manufacturer's certificate of conformance to the City. Pipe shall be marked with manufacturer's identification.

6.03 FITTINGS

- A. **Two-inch Pipes:** Gasketed joint standard dimension ratio (SDR) 21 PVC or galvanized steel fittings shall be used with all 2-inch PVC pipe. PVC adapters, Harco as manufactured by the Harrington Corporation or approved equal, shall be used for jointing to 2-inch gate valves, galvanized fittings, and existing threaded pipe.
- B. **Four-inch Through 36-inch Pipes**
 - 1. **Molded PVC Pressure Fittings:** Fittings for 4-inch through 8-inch sanitary sewer pressure pipe shall be molded PVC pressure fittings, unless DI fittings are directed by the Engineer. Molded PVC fittings shall meet the requirements of ANSI/AWWA C900, and shall be Harco Class 150 as manufactured by the Harrington Corporation, or approved equal, as directed by the Engineer.
 - 2. **DI Fittings:** Fittings for pipe larger than 8-inch shall be DI. DI fittings for 4-inch through 36-inch PVC pressure pipe shall conform to ANSI/AWWA C110 or C153 and shall conform to the Technical Specifications section headed "Piping Materials: Ductile Iron Pipe."
- C. Where flanged fittings are shown, specified, or directed by the Engineer, adapter flanges shall be used on plain end PVC pipe. Adapter flanges shall be suitable for PVC pipe and be equal to Uni-Flange Series 900 as manufactured by Ford/Uni-Flange, Wabash, Indiana.

6.04 JOINTS

Pipe joints shall be plain end, rubber gasket push-on joints, unless otherwise shown. Push-on joints shall meet the requirements of ASTM D 3139.

Joints to DI fittings shall be rubber gasket mechanical joints with retainer glands, unless otherwise shown. All retainer glands shall be UL listed or FM approved. The retainer glands shall be installed in accordance with the manufacturer's recommendations.

Mechanical joints shall meet the requirements of ANSI/AWWA C111.

6.05 MARKINGS AND COLOR CODING

In addition to the standard markings required by ANSI/AWWA C900 and C905, the letters NSF denoting National Sanitation Foundation approval shall be included in the marking system, on each pipe length and fitting.

Project No.

PVC pipe shall be manufactured of solid color as specified, or white with continuous colored ink lettering. The applicable color codes, with light color stabilant, are as follows:

Pipe Use	Color Coding
Potable Water	Safety Blue
Sanitary Sewer	Safety Green
Reclaimed Water	Safety Purple

UV resistant PVC pipe shall be solid color as specified above, or white with colored lettering as specified above.

6.06 HARNESSING

Ductile iron fittings with mechanical joints used with PVC pipe that require harnessing, shall be provided with ductile iron retainer glands such as Series 2000 PV Megalug as manufactured by EBAA Iron Inc., Stargrip 4000 as manufactured by Star Pipe Products, or approved equal.

PVC push-on joints for pipe in casings, for joints to PVC pressure fittings, or where shown, shall be harnessed using a ductile iron retainer for push-on joint PVC pipe, such as Series 1600 as manufactured by EBAA Iron Inc. , Series 1100 as manufactured by Star Pipe Products, or approved equal.

Technical Specifications
Section 6 - Piping Materials: PVC Pressure Pipe

Project No.

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SECTION 7 - PIPING MATERIALS: MISCELLANEOUS

7.01 GENERAL

The Work in this section includes furnishing miscellaneous piping materials and appurtenances, including:

- Vitrified clay pipe
- Corrugated metal pipe
- Corrugated aluminum pipe
- Roadway underdrain
- Corrugated High Density Polyethylene (CHDPE) drainage pipe
- High Density Polyethylene (HDPE) profile wall drainage pipe
- High Density Polyethylene (HDPE) pressure pipe
- Fiberglass Reinforced Polymer Mortar Pipe (FRPMP)

Standards referenced in this Section are the latest revision of the following specifications:

AASHTO M 294	"Corrugated Polyethylene Pipe, 12- to 36-Inch Diameter"
ANSI/AWWA C906	"Polyethylene (PE) Pressure Pipe and Fittings, 4-Inch Through 63-Inch for Water Distribution and Transmission"
ASTM C 425	"Specification for Compression Joints for Vitrified Clay Pipe and Fittings"
ASTM C 700	"Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated"
ASTM D 1248	"Specification for Polyethylene Plastics Molding and Extrusion Materials"
ASTM D 2412	"Standard Test Method for Determination of External Loading characteristics of Plastic Pipe by Parallel-Plate Loading"
ASTM D 3262	"Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe"
ASTM D 3350	"Standard Specification for Polyethylene Plastics Pipe and Fittings Materials"
ASTM D 3517	"Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pressure Pipe"
ASTM D 4161	"Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Joints Using Flexible Elastomeric Seals"
ASTM F 477	"Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe"
ASTM F 758	"Specification for Smooth-Wall Poly(Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage"

Technical Specifications
Section 7 - Piping Materials: Miscellaneous

Project No.

ASTM F 894	“Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe”
DOT-SSRBC Section 943	“Corrugated Steel Pipe and Pipe Arch (Including Underdrain)”
DOT-SSRBC Section 945	“Aluminum Pipe, Including Underdrain, Pipe Arch and Structural Plate Pipe and Pipe Arch”
DOT-SSRBC Section 948	“Miscellaneous Types of Pipe”
DOT-SSRBC Section 948-2.3	“Corrugated Polyethylene Pipe (12 to 40 inches)”
UNI-B-6-98	“Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe” Uni-Bell Plastic Pipe Association, Dallas, Texas

7.02 VITRIFIED CLAY PIPE

Vitrified clay pipe shall conform to ASTM C 700, extra strength. Joints shall be compression type and shall conform to ASTM C 425.

7.03 CORRUGATED METAL PIPE

Corrugated metal pipe shall be bituminous coated galvanized steel conforming to applicable requirements of DOT-SSRBC Section 943.

7.04 CORRUGATED ALUMINUM PIPE

Corrugated aluminum pipe shall conform to applicable requirements of DOT-SSRBC Section 945.

7.05 ROADWAY UNDERDRAIN PIPE

Roadway underdrain pipe of 4-inch to 10-inch nominal diameter, to be used alongside, but not under, pavement shall be either of the following: Polyvinyl Chloride (PVC) perforated pipe conforming to the requirements of DOT-SSRBC Section 948-1.5 or ASTM F 758; or Corrugated High Density Polyethylene (CHDPE) drainage (perforated) tubing Type SP, Class I perforations, conforming to the requirements of DOT-SSRBC Section 948.

Where underdrains must cross under roadways, non-perforated 6-inch Pressure Class 350 ductile iron pipe shall be used.

Roadway underdrain pipe to be used for filter drains, detention ponds, or drawdown filters shall be as specified on the Plans. Where not specified on the Plans, the pipe shall be PVC pipe and shall conform to the requirements of ASTM F 758. Perforations shall be in 9 rows 22.5 degrees apart every 3 inches of pipe.

7.06 CORRUGATED HIGH DENSITY POLYETHYLENE (CHDPE) DRAINAGE PIPE AND FITTINGS, SMOOTH INTERIOR

This article covers the requirements for Corrugated High Density Polyethylene (CHDPE) gravity drainage pipe, split coupler with elastomeric seal (gasket) and fittings, Classification Type S (full circular cross-section, with an outer corrugated pipe wall and a smooth inner liner), of 12-inch to 36-inch nominal diameter and all conforming to the applicable requirements of AASHTO M 294 and the additional provisions as specified in DOT-SSRBC Section 948-2.3

In general, CHDPE drainage pipe is used along side, but not under, pavement. Where a storm drain crosses under pavement (roadway), alternative pipe/culvert materials may be used as shown on the Plans.

Elastomeric seals (gaskets) shall comply in all respects with the physical requirements specified in low pressure criteria of ASTM F 477.

As a basis of the acceptance of CHDPE gravity drainage pipe and fittings, manufacturer's certification and corresponding affidavit of conformance and report of test results shall be furnished attesting that the product was manufactured, sampled, tested, and inspected in accordance with the requirements of AASHTO M 294 and related documents. Each standard and random length of pipe shall be clearly marked by the manufacturer in conformance with criteria and information as specified in AASHTO M 294.

7.07 HIGH DENSITY POLYETHYLENE (HDPE) PROFILE WALL DRAINAGE PIPE AND FITTINGS, SMOOTH INTERIOR

This article covers the requirements for High Density Polyethylene (HDPE) profile wall gravity drainage pipe and fittings with integral bell and spigot gasketed joints, of 18-inch to 96-inch nominal diameter, and conforming to the applicable requirements of ASTM F 894.

In general, HDPE profile wall pipe is used along side, but not under, pavement. Where a storm drain crosses under pavement (roadway), alternative pipe/culvert materials may be used as shown on the Plans.

The pipe and fittings shall be made of high density, high molecular weight, polyethylene pipe material meeting the requirements of Type III, Class C, Category 5, Grade P34, as defined in ASTM D 1248, and shall possess a nominal ring stiffness constant (RSC) of Class 160. Materials meeting the requirements of ASTM D 3350 with a cell classification PE 334433C or higher are also suitable.

Elastomeric seals (gaskets) shall comply in all respects with the physical requirements specified in low pressure criteria of ASTM F 477.

As a basis of the acceptance of HDPE profile wall gravity drainage pipe and fittings, manufacturer's certification and corresponding affidavit of conformance and report of test results shall be furnished attesting that the product was manufactured, sampled, tested, and inspected in accordance with the requirements of ASTM F 894 and related documents. Each standard and random length of pipe shall be clearly marked by the manufacturer in conformance with criteria and information as specified in ASTM F 894.

7.08 HIGH DENSITY POLYETHYLENE (HDPE) PRESSURE PIPE AND FITTINGS

This article covers the requirements for High Density Polyethylene (HDPE) pressure pipe, including potable water mains, reclaimed water mains, and sanitary force mains, 2-inch and larger.

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HDPE pipe and related fittings shall be in accordance with ANSI/AWWA C906, and shall be made with prime virgin resins exhibiting a minimum cell classification as defined in ASTM D 3350 and meeting the PE 3408 code designation, with pressure classifications and corresponding dimension ratios equal to the following:

Type of Pipeline System	Diameter	Pressure Class	Dimension Ratio
Potable water pipeline	2-inch and larger	160 psig	11
Reclaimed water pipeline	2-inch and larger	160 psig	11
Sewer force mains	All sizes	160 psig	11

Note: Values are applicable through 80°F (27°C) in accordance with ANSI/AWWA C906.

HDPE pipe of 2-inch nominal diameter shall be joined by means of zero leak-rate butt (thermal heat) fusion weld and/or approved flanged joints, with the outside diameter dimension of Schedule 40 iron pipe. Flanged joints shall not be used underground for horizontal directional drilling applications.

HDPE pipe 4-inch and larger shall be joined by means of zero leak-rate butt (thermal heat) fusion weld and/or approved flanged joints, all meeting the requirements of ANSI/AWWA C906, with outside diameter the dimension of ductile iron pipe. Flanged joints shall not be used underground for horizontal directional drilling applications.

All joints shall provide axial pull-out resistance.

HDPE mechanical joint adapters shall be used with ductile iron fittings when directed by the Engineer, in strict accordance with manufacturer's recommendations.

All HDPE pipe and fittings shall be jointed in strict accordance with the manufacturer's recommendations.

During extrusion production, all HDPE pipe shall have been continuously marked with durable printing indicating at a minimum:

- Nominal size (inches)
- Dimension ratio (DR)
- Pressure rating (psi)
- Trade name
- Material classification (PE 3408)
- Plant, extruder, and operator codes
- Resin supplier code
- Date produced

HDPE pipe shall be black in color with permanent colored stripes extruded into the pipe length or shall be one solid color, as follows:

Pipe Use	Color Coding
Potable Water	Safety Blue
Sanitary Sewer	Safety Green
Reclaimed Water	Safety Purple

HDPE pipe used for potable water mains shall bear the NSF seal of approval.

7.09 FIBERGLASS REINFORCED POLYMER MORTAR PIPE (FRPMP)

A. General

This article includes the requirements for Fiberglass Reinforced Polymer Mortar Pipe (FRPMP) for micro-tunneling (18-inch and larger) and gravity sanitary sewer mains (28-inch to 48-inch in diameter).

B. Materials

1. **Resin Systems:** The manufacturer shall use only polyester resin systems with a proven history of performance in this particular application. The historical data shall have been acquired from a composite material of similar construction and composition as the proposed product.
2. **Glass Reinforcements:** The reinforcing glass fibers used to manufacture the components shall be of highest quality commercial grade E-glass filaments with binder and sizing compatible with impregnating resins.
3. **Silica Sand:** Sand shall be minimum 98% silica with a maximum moisture content of 0.2%.
4. **Additives:** Resin additives, such as curing agents, pigments, dyes, fillers, and thixotropic agents, when used, shall not detrimentally affect the performance of the product.
5. **Elastomeric Gaskets:** Gaskets shall be supplied by qualified gasket manufacturers and be suitable for the service intended.

C. Manufacture and Construction

1. **Pipes:** Manufacture of pipe shall be by a method resulting in a dense, non-porous, corrosion-resistant, consistent composite structure.
2. **Joints:** Unless otherwise specified, the pipe shall be field connected with fiberglass couplings that utilize elastomeric sealing gaskets made of EPDM rubber compound as the sole means to maintain joint watertightness. The joints shall meet the performance requirements of ASTM D 4161. Joints at tie-ins, when needed, may utilize fiberglass, gasket-sealed closure couplings.
3. **Fittings:** Flanges, elbows, reducers, tees, wyes, laterals and other fittings shall be capable of withstanding all operating conditions when installed. They may be contact molded or manufactured from mitered sections of pipe joined by glass-fiber-reinforced overlays. Properly protected standard ductile iron, fusion-bonded epoxy coated steel and stainless steel fittings may also be used.
4. **Diameters:** The nominal pipe diameters and tolerances shall be in accordance with ASTM D 3262 and ASTM D 3517, as applicable. Other diameters shall be per manufacturer's literature.

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5. Lengths

- a. **Gravity sewer pipe:** Pipe shall be supplied in nominal lengths of 20 feet unless otherwise approved by the City.
- b. **Microtunnel pipe:** Pipe shall be in nominal lengths of 10 or 20 feet as specified or directed by the Engineer.
- c. Actual laying length of each pipe section supplied shall be nominal +1, -4 inches. At least 90% of the total footage of each size and class of pipe, excluding special order lengths, shall be furnished in nominal length sections unless otherwise approved by the City.

6. Wall Thickness

- a. **Gravity sewer pipe:** The minimum wall thickness shall be the stated design thickness.
- b. **Microtunnel pipe:** The minimum wall thickness, measured at the bottom of the spigot gasket groove where the wall cross-section has been reduced, is determined from the maximum allowable jacking load. Minimum factor of safety against jacking force is based on straight alignment.

7. **End squareness:** Pipe ends shall be square to the pipe axis with a maximum tolerance of 1/16 inch.

D. Testing Requirements

1. **Pipes:** Pipes shall be manufactured and tested in accordance with ASTM D 3262.
2. **Joints:** Coupling Joints shall meet the requirements of ASTM D 4161.
3. **Stiffness**
 - a. **Gravity sewer pipe:** Minimum pipe stiffness when tested in accordance with ASTM D 2412 shall be normally 36 psi.
 - b. **Microtunnel pipe:** Minimum pipe stiffness when tested in accordance with ASTM D 2412 shall be normally 140 psi. Minimum wall thickness and minimum pipe stiffness are based on jacking capacity. Minimum requirements shall be verified with pipe manufacturer.

E. Inspection

The City or its designated representative shall be entitled to inspect pipes or witness the pipe manufacturing.

Should the City request to see specific pipes during any phase of the manufacturing process, the manufacturer shall provide the City with adequate advance notice of when and where the production of those pipes will take place.

F. Packaging, Handling, and Shipping

Packaging, handling, and shipping shall be done in accordance with the manufacturer's instructions.

G. Execution

1. **Installation:** The installation of pipe and fittings shall be in accordance with the Project Plans and Specifications and the manufacturer's requirements.
2. **Pipe Handling:** Textile slings, other suitable materials, or a forklift shall be used. Use of chains or cables is not acceptable.
3. **Jointing**
 - a. Ends of pipe and joint components shall be cleaned.
 - b. Joint lubricant shall be applied to the bell interior surface and the elastomeric seals. Only lubricants approved by the pipe manufacturer shall be used.
 - c. Suitable equipment and end protection shall be used to push the pipes together.
 - d. Forces recommended by the manufacturer for joining or pushing pipe shall not be exceeded.
4. **Field Tests**
 - a. **Infiltration/exfiltration test:** Maximum allowable leakage shall be in accordance with the Technical Specification section headed "Sanitary Sewer Construction."
 - b. **Low pressure air test:** Each pipeline reach may alternatively be tested with air pressure (minimum 3.5 psi, maximum 5 psi) in accordance with UNI-BELL UNI-B-6-98 "Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe." The system passes the test if the pressure drop due to leakage through the pipe or pipe joints is less than or equal to 0.5 psig over the time period described below.

Minimum time period for a 0.5 psig pressure drop

The time period for the test shall be calculated from UNI-B-6-98 as follows:

$$T = 28.33 DK,$$

T = Shortest time, in seconds allowed for the air pressure to drop 0.5 psig,

$$K = .000419 DL, \text{ but not less than } 1.0,$$

D = Nominal pipe diameter in inches, and

L = Length of pipe being tested in feet.

- c. **Individual joint testing:** For pipes large enough to enter, individual joints may be pressure tested with a portable tester to 5 psi maximum with air or water, in lieu of line infiltration, exfiltration, or air testing.
- d. **Deflection:** The maximum allowable cross-sectional deflection for FRPMP is determined by measuring the vertical cross-section deflection inside the pipe at 20-foot and 40-foot intervals from each manhole, upstream and downstream, and is governed by the following criteria:
 - 1) Initial vertical cross-section deflection measured within the first 24 hours after completion of backfilling and removal of dewatering systems shall not exceed 3 percent of original pipe inside diameter.
 - 2) Accumulated vertical cross-section deflection measured 30 consecutive calendar days after completion of backfilling and removal of dewatering systems shall not exceed 4 percent of original pipe inside diameter.

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- e. The exhibition of deflection or leakage in excess of allowable will be grounds for rejection of the pipeline (run).
- f. Any pipeline found to be unacceptable by the Engineer shall be corrected, repaired, or replaced, as directed by the Engineer, at no additional cost to the City.

SECTION 8 - PAVING MATERIALS

8.01 GENERAL

The Work in this section includes furnishing of materials for paving roadways, curbs, sidewalks, driveways, alleys, etc. The Work in this section includes stabilized subgrade, base, and surface course. The Work in this section also includes furnishing incidental materials. Concrete paving materials are specified in the Technical Specifications section headed "Concrete, Masonry, and Reinforcing Steel."

Technical Specifications referencing pertinent sections and articles of DOT- SSRBC pertain to Florida Department of Transportation "Standard Specifications for Road and Bridge Construction, 2000 Edition" unless otherwise noted.

8.02 SUBGRADE STABILIZING MATERIAL

Material for stabilization of the stabilized subgrade shall be limerock conforming to DOT-SSRBC Articles 160-4 and 160-7, and Section 914 (Type B). Other types of stabilization, including use of admixtures, may be used if approved by the Engineer and if laboratory data are produced demonstrating that the intent of these Specifications is achieved.

8.03 ROADWAY BASE

Roadway base material shall be limerock, shell, asphalt, or reclaimed concrete. Limerock shall be used unless otherwise shown or approved by the Engineer.

Limerock shall conform to DOT-SSRBC Section 911. The minimum limerock bearing ratio (LBR) value shall be 100.

Shell shall conform to DOT-SSRBC Section 913.

Asphalt base shall be constructed as indicated on the Plans. Asphalt base shall conform to all applicable requirements of DOT-SSRBC Section 331 (Type ABC-3). Reclaimed asphalt may be utilized in asphalt roadway base materials in accordance with DOT-SSRBC 2004 Article 334-2.5 except as modified by Technical Specifications Article 8.07. The proportion and properties of reclaimed asphalt shall be provided in the design mix submittals.

Reclaimed Portland cement concrete shall be crushed and processed to provide a clean, hard, durable concrete aggregate having a uniform gradation conforming to DOT-SSRBC Provisional Standards (8-8-07) Section 204, and shall be free of deleterious substances such as (but not limited to) adherent coatings, steel reinforcement, organic matter, other base materials, joint fillers, bituminous materials, reactive aggregates, or material which has been contaminated by hazardous materials. The materials and successful construction of roadway base using crushed concrete shall conform to all applicable requirements of DOT-SSRBC Provisional Standard Section 204 and Section 901 complete, except as specified herein.

Reclaimed concrete base material (finished in place) shall have a limerock bearing ratio of not less than 120.

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8.04 PRIME AND TACK COATS

Prime and Tack Coats shall conform to all applicable requirements of DOT-SSRBC Article 300-1 through 7.

8.05 LEVELING COURSE

Leveling course shall conform to all applicable requirements of DOT-SSRBC Section 331 (Type S-III). The leveling course shall have a minimum Marshall Stability of 1,500 pounds. Reclaimed asphalt pavement may be utilized in non-surface courses in accordance with DOT-SSRBC 2004 Article 334-2.5 except as modified by Technical Specifications Article 8.07. The proportion and properties of reclaimed asphalt pavement materials shall be provided in the design mix submittals.

8.06 ASPHALTIC CONCRETE SURFACE COURSE AND BINDER COURSE

Plant mixed Type SP-1, S-1, or S-III asphaltic concrete shall be used for surface course and binder course in roadways, alleys, and parking lots, and for asphaltic curb, as specified or ordered by the Engineer. Overlaying existing parking lots shall be constructed with DOT Type S-III asphaltic concrete. Types SP-1, S-1, and S-III shall conform to all applicable requirements of the 2000 Edition of the DOT-SSRBC Sections 320, 330, and 331 except as modified by the Project Technical Specifications. Reclaimed asphalt pavement may be utilized in accordance with DOT-SSRBC 2004 Article 334-2.5 except as modified by Technical Specifications Article 8.07. Types SP-1, S-1, and S-III asphaltic concrete shall have a minimum Marshall Stability (50 blows) of 1,500 pounds as determined by the Marshall test.

A. Type SP-1 Asphaltic Concrete

Type SP-1 shall be mixed as follows:

Percent Passing by Weight:	<u>Sieve Size</u>	<u>Gradation Design Range</u>
	3/4 inch	100
	1/2 inch	100
	3/8 inch	90 - 100
	No. 4	47 - 75
	No. 10	31 - 53
	No. 40	19 - 35
	No. 80	7 - 21
	No. 200	2 - 6
Design Mix Asphalt Content:	5% - 7%	
Effective Asphalt Content:	5.0% minimum *	
Air Voids:	4.5% - 6.5%	
Flow (0.01 inches):	8 - 14	
VMA:	15% - 25% minimum	
Additives:	none except anti-strip agent	
Mixing Temperature:	300°F (+/- 25°F) or As Approved	
Delivery Site Temperature:	275°F minimum or As Approved	

B. Type S-1 Asphaltic Concrete

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Type S-I shall be mixed as follows:

Percent Passing by Weight:	<u>Sieve Size</u>	<u>Gradation Design Range</u>
	3/4 inch	100
	1/2 inch	88 - 98
	3/8 inch	75 - 93
	No. 4	47 - 75
	No. 10	31 - 53
	No. 40	19 - 35
	No. 80	7 - 21
	No. 200	2 - 6
Design Mix Asphalt Content:	5% - 9%	
Effective Asphalt Content:	5.0% minimum *	
Air Voids:	4% - 5%	
Flow (0.01 inches):	8 - 13	
VMA:	14.5% minimum	
Additives:	none except anti-strip agent	
Mixing Temperature:	300°F (+/- 25°F) or As Approved	
Delivery Site Temperature:	275°F minimum or As Approved	

C. Type S-III Asphaltic Concrete

Type S-III shall be mixed as follows:

Percent Passing by Weight:	<u>Sieve Size</u>	<u>Gradation Design Range</u>
	1/2 inch	100
	3/8 inch	88 - 98
	No. 4	60 - 90
	No. 10	40 - 70
	No. 40	20 - 45
	No. 80	10 - 30
	No. 200	2 - 6
Design Mix Asphalt Content:	5% - 9%	
Effective Asphalt Content:	5.0% minimum *	
Air Voids:	4% - 6%	
Flow (0.01 inches):	8 - 13	
VMA:	15.5% minimum	
Additives:	none except anti-strip agent	
Mixing Temperature:	300°F (+/- 25°F) or As Approved	

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Delivery Site Temperature: 275°F minimum or As Approved

** The ratio of the percentage by weight of total aggregate passing the 75 μ m sieve to the effective asphalt content expresses as a percentage by weight of total mix shall be in the range of 0.6 to 1.2.*

The Contractor shall furnish the Engineer with design mix data, graphs, and certificates certifying that the above requirements are being met, including asphalt cement data to establish mixing and compaction temperatures.

Asphaltic concrete surface course for driveways shall conform to all applicable requirements of DOT-SSRBC Section 333 (Type III).

8.07 RECLAIMED ASPHALT PAVEMENTS

The proportion and properties of reclaimed asphalt pavement materials shall be provided in the design mix submittals.

Reclaimed asphalt pavement (RAP) materials may be used as a component material of the asphalt mixture not to exceed 25 percent by weight of the total aggregate, and shall be provided in accordance with FDOT SSRBC.2004 Article 334-2.5 requirements.

8.08 SURFACE SHELL

Surface shell shall conform to applicable requirements of DOT-SSRBC Section 913. Shell shall be washed to remove clay and other undesirable materials.

SECTION 9 - ROADWAY CONSTRUCTION

9.01 GENERAL

The Work in this section includes construction of roads, alleys, driveways, parking areas, curbs, gutters, sidewalks, and other related construction.

Excavation, grading, and concrete used to complete this Work shall conform to the applicable Technical Specifications sections, unless otherwise modified herein or on the Plans.

All paving materials shall conform to the Technical Specifications section headed "Paving Materials."

Hex block sidewalk, brick pavers, and granite curb shall be carefully salvaged and delivered to the City Utilities Complex Yard as directed by the Engineer.

Technical Specifications referencing pertinent sections and articles of DOT- SSRBC pertain to Florida Department of Transportation "Standard Specifications for Road and Bridge Construction, 2000 Edition."

9.02 DATA TO BE SUBMITTED

The Contractor shall submit shop drawings, and samples where specified, in accordance with the *General Conditions, Article 36*, for the following materials:

Stabilization	Reclaimed Concrete
Base	Brick
Asphaltic Concrete	Expansion Joints
Concrete	Prime and Tack Coats

The Contractor shall submit to the City in writing the proposed asphalt design mixes and sufficient samples for study and testing.

9.03 STABILIZED SUBGRADE

The roadway subgrade shall be stabilized, as shown on the Plans for the various types of paving, and compacted to a minimum density as specified in the Technical Specifications section headed "Excavation and Backfill." Existing soils, approved by the Engineer, may be reused in the stabilized areas. Unsuitable material, including rock, organic matter, muck, and other material determined by the Engineer to be unsuitable, shall be removed as specified in the Technical Specifications section headed "Excavation and Backfill."

After the excavated areas have been properly backfilled to the grade of the bottom of the stabilization, suitable stockpiled material may be used to stabilize the subgrade in a normal manner. Construction method and material shall conform to all applicable requirements of DOT-SSRBC Section 160, (Type B), and these Specifications.

The minimum Limerock Bearing Ratio (LBR) value shall be 40, unless noted otherwise on the Typical Roadway Section Details on the Plans.

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9.04 ROADWAY BASE

The roadway base shall be constructed as shown on the Plans. Construction methods shall conform to all applicable requirements of DOT-SSRBC Sections 200, 204, 250, and 280. Applicable compaction tests will be conducted according to the Technical Specifications section headed "Excavation and Backfill."

9.05 PRIME AND TACK COATS

All limerock, shell, and reclaimed concrete base courses shall be given a prime coat, of the type and rate as specified in DOT-SSRBC Section 300, prior to application of the asphaltic concrete surface. A tack coat shall be applied to limerock, shell, and reclaimed concrete base courses if the prime coat has lost its bonding effect, as ordered by the Engineer. Tack coats for hot bituminous courses shall be required between courses and for asphaltic base.

9.06 LEVELING COURSE (Asphaltic Concrete Overbuild Course)

Where required as shown on the Plans or as directed by the Engineer, an overbuild course shall be applied to correct and/or change the existing cross slope. Construction materials and workmanship shall conform to the applicable requirements of DOT-SSRBC Sections 330 and 333.

9.07 ASPHALTIC CONCRETE PAVEMENT

All asphalt pavement shall be constructed of asphaltic concrete of type and thickness as shown on the Plans and placed where directed by the Engineer. Construction material and workmanship shall conform to applicable requirements of DOT-SSRBC Sections 320, 330, 331, and 332, and the Technical Specifications section headed "Paving Materials."

Unless specified elsewhere, all asphaltic concrete shall be plant mixed Type SP-1 mix as specified. Asphaltic concrete shall be placed and compacted to provide a minimum thickness as specified or as shown on the Plans.

Upon delivery of the asphaltic concrete mix to the construction site, the City will obtain samples in accordance with ASTM D 979 and perform quality assurance testing of asphaltic concrete, on approximately 300-ton intervals, to determine conformance to the approved design mix. For materials delivered which show nonconformity with the properties of the approved mix, payment will be reduced according to the following schedule. Reductions in the unit price payment are cumulative, except aggregate gradation, as noted.

The following indicate the difference in the test of delivered material compared to the approved design mix, and the corresponding partial payment percentages to be applied to the unit price to be paid for the asphaltic concrete pavement in place.

Deviation from Target Density:

<u>% of Target Density</u>	<u>% Payment</u>
98.0 and above	100
97.0 to less than 98.0	95
96.0 to less than 97.0	90
Less than 96.0	75, if accepted by Engineer

Where % of Target Density = $\frac{\text{Average Density of Cores}}{\text{Target Density}} \times 100$

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Target Density

And Target Density is 0.96 x Mix Design Density

The Engineer reserves the right to reject and require the removal of asphaltic concrete pavement with a field density less than 96.0% of target density.

Deviation from Mix Design - Aggregate Gradation Percentages:

<u>Sieve</u>	<u>100% Payment</u>	<u>95% Payment</u>	<u>80% Payment, if accepted</u>
No. 4	0.0 to 7.0	7.1 to 10.00	Over 10.00
No. 10	0.0 to 5.5	5.51 to 8.50	Over 8.50
No. 40	0.0 to 4.5	4.51 to 7.50	Over 7.50
No. 200	0.0 to 2.0	2.01 to 2.80	Over 2.80

Note: If 2 or more payment adjustments for aggregate gradation occur, only the larger will apply.

Deviation from Mix Design - Asphalt Content:

<u>% Asphalt Extraction</u>	<u>% Payment</u>
0.0 to 0.55	100
0.56 to 0.65	95
0.66 to 0.75	90
Over 0.75	80, if accepted by Engineer

Thickness: In addition to other criteria, payment will be reduced for asphaltic concrete pavement thickness that is less than as specified or as shown on the Plans. Partial payment will be based on city block averaged measurement of corings of in-place asphaltic concrete pavement according to the following schedule:

<u>Average Thickness Deficiency</u>	<u>% Payment</u>
0 - 1/4 inch	75
Greater than 1/4 inch	0 or overlay to meet or exceed specified thickness, as directed

Testing and Acceptability: The thickness and density of pavement shall be sampled and evaluated for payment between city blocks as measured from center line to center line of street intersections. The thickness and density of the pavement shall be determined in accordance with ASTM D 3549 and FM 1-T166, from cores at intervals no greater than 300 feet, with a minimum of 2 cores per city block; cores shall be at least 2-inch in diameter. Samples shall be taken at points on the cross section and along the roadway as selected by the Engineer, and the results averaged for that block. The Contractor may request a maximum of 4 additional cores per block at locations selected by him and at his expense.

The Contractor shall overlay areas which are determined to be excessively thin or excessively deficient in density, as directed by the Engineer. The use of city block averaging will not constitute a waiver of any kind to conforming to the requirements of the Plans and these Specifications.

Testing procedures for the aforementioned criteria will be performed in accordance with the methods described in *Manual of Florida Sampling and Testing Methods*, by the Florida Department

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of Transportation, Office of Materials and Research. The corresponding designations for these testing methods are as follows:

Lab Density	FM 1 - T166
Field Density	FM 1 - T166
Aggregate Gradation	FM 1 - T030
% Asphalt Extraction	FM 5 - 544
Stability	FM 5 - 511

9.08 CONCRETE SIDEWALKS AND DRIVEWAYS

Construction of new concrete sidewalks and driveways shall conform to applicable requirements of DOT-SSRBC Section 522, and as shown on the Plans.

Where new construction is to be tied into existing facilities, the old material shall be removed back to the nearest construction joint, or saw cut to a straight line as directed by the Engineer.

Sidewalk curb ramps shall be constructed at all designated pedestrian locations where sidewalks meet the curb. Those existing sidewalks which are removed to accomplish associated Work as a part of this Project shall be replaced with a new sidewalk and curb ramp when the sidewalk meets the curb. Construction of sidewalk curb ramps shall be in accordance with City Standard details or as directed by the Engineer.

Concrete pour for walk construction shall be made only on dampened subgrade. A soft broom finish shall be given the walk surface as directed by the Engineer.

New sidewalks shall be 4 inches thick unless otherwise shown on the Plans.

Sidewalks crossing driveways and residential concrete driveways shall be 5 inches thick and shall include placing a single layer of 6-inch by 6-inch wire mesh (WWF 6 x 6 - W1.4 x W1.4).

Commercial concrete drives shall be 6 inches thick with a double layer of 6-inch by 6-inch wire mesh (WWF 6 x 6 - W1.4 x W1.4).

9.09 CURBS, GUTTERS, AND VALLEY GUTTERS

All new curbs, gutters and valley gutters shall be constructed of concrete to alignments as shown on the Plans and as directed by the Engineer. Materials and workmanship shall conform to applicable requirements of DOT-SSRBC Section 520 and these Specifications. Expansion joints with 1/2-inch bituminous strip or approved equal shall be installed 50 feet on centers and struck joints 3/4-inch in depth, 10 feet on centers. All reinforcing steel shall be securely tied in position within the forms prior to the pouring of concrete. Wire chairs (or approved equal) shall be used to secure reinforcing steel for Type A curb and elsewhere if feasible.

Drop curbs shall be constructed at driveways, alleys, and pedestrian ramps along the Project length, or at locations directed by the Engineer.

9.10 SHALLOW PIPES

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Storm drains and pressure pipes (sanitary force mains and water mains) may in some cases encroach into the stabilized base or the base to be constructed as part of the roadway. Extreme caution shall be exercised by the Contractor to protect shallow pipes during stabilization and base compaction. Where shallow storm drains and/or pressure pipes encroach into the area to be stabilized, the Contractor shall provide properly compacted, as specified, base material in 3 lifts around the pipe and to a distance of 12 inches horizontally beyond the outside of the pipe to the depth of the required stabilization unless the Plans call for a different depth.

9.11 ADJUSTMENT OF EXISTING MANHOLE COVERS AND VALVE BOXES

The Contractor shall make vertical adjustments to existing manhole covers and valve boxes within or adjacent to all proposed construction. Covers and valve boxes shall be adjusted to elevations compatible to proposed roadway or parkway grades. Manhole cover rim grades shown on the Plans are approximate.

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SECTION 10 - SANITARY SEWER CONSTRUCTION

10.01 GENERAL

The Work in this section includes construction of sanitary sewer gravity pipes, force mains, manholes, and appurtenances.

Sanitary Sewers are to be constructed at locations indicated on the Plans. The City reserves the right, however, to make minor changes in grade and/or alignment as the Work progresses.

All Work shall be fully completed within the established limits as outlined for the various Pay Items listed in the Proposal. It is not the intent of the City to allow additional compensation for obstructions, interferences, or similar contingencies on this Project.

All force main pipe and fittings shall be furnished and installed in accordance with the applicable requirements of the Technical Specifications sections headed "Piping Materials: Ductile Iron Pipe," "Piping Materials: PVC Pressure Pipe," "Piping Materials: Miscellaneous," and "Pressure Pipe Construction."

At the ends of the sections where adjoining pipelines have not been completed and are not ready to connect, temporary bulkheads or plugs (as specified herein) approved by the Engineer shall be installed. All such bulkheads or plugs shall be removed when they are no longer needed or when ordered by the Engineer.

All pipelines shall be tested and closed circuit television video (CCTV) inspected. Any leak or defect shall be repaired and re-televised. Tests shall be conducted in accordance with these Specifications.

PVC pipe for gravity sewers shall be tested for allowable deflection. Tests shall be conducted in accordance with the requirements of these Specifications.

Connections between dissimilar gravity pipe materials or diameters shall be made as specified herein.

Connections between pressure pipes shall be made with solid sleeves as specified herein.

The ends of all new sanitary laterals shall be marked by witness posts or protruding galvanized pipe, as directed by the Engineer. Witness posts shall be 4-inch diameter PVC pipe filled with concrete; 4 to 5 feet of the pipe shall be exposed and wrapped with green tape. The 1-inch diameter galvanized pipe shall protrude 1 inch above grade.

The following Standards are referenced in this section:

ASTM C 12	"Practice for Installing Vitrified Clay Pipe Lines"
ASTM C 76	"Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe"
ASTM C 443	"Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets"

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ASTM C 478	"Standard Specification for Precast Reinforced Concrete Manhole Sections"
ASTM C 1107	"Standard Specification for Packaged Dry, Hydraulic-Cement Grout (NonShrink)"
ASTM D 2321	"Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications"
ASTM D 3034	"Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings"
ASTM D 3753	"Standard Specification for Glass-Fiber-Reinforced Polyester Manholes"
ASTM F 477	"Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe"
ASTM F 679	"Standard Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings"
UNI-B-6-98	"Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe" Uni-Bell Plastic Pipe Association, Dallas, Texas

10.02 DATA TO BE SUBMITTED

The Contractor shall submit shop drawings in accordance with the General Conditions, Article 36, for the following materials:

- Piping materials
- Fittings and couplings
- Grouting rings
- Pipe-to-manhole connectors
- Precast manholes
- Fiberglass manholes
- Castings
- Wall sleeves
- Special construction methods
- Interior cementitious coating (including applicator's certification from manufacturer)

10.03 MATERIALS

All materials shall be furnished by the Contractor, unless otherwise noted on the Plans. All materials shall be new and of the best quality available. Materials not specifically specified shall conform to applicable provisions of the DOT-SSRBC.

- A. **Piping Materials:** Sanitary sewer pipe shall either be green in color or shall be white with continuous colored green ink lettering or shall be continuously painted green along the top 1/3 of the pipe with 2-part high build epoxy-polyamide paint. All sanitary sewers shall be installed accompanied by green colored metallic identification tape laid 1 foot above the pipe, cut every 10 feet.

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1. Ductile iron pipe and fittings for force mains or gravity sewers shall conform to the Technical Specifications section headed "Piping Materials: Ductile Iron Pipe."
2. PVC gravity sewer pipe and fittings 4-inch through 15-inch, intended for non-pressure service, shall comply with ASTM D 3034, Type PSM; a dimension ratio of SDR 26 and a minimum pipe stiffness of 115 psi shall be used. Joints and gaskets shall comply with ASTM F 477. PVC fittings for use on 4-inch through 15-inch PVC pipe shall be Harco Gasketed PVC Sewer Fittings as manufactured by Harrington Corp. or approved equal.

PVC gravity sewer pipe and fittings 18-inch through 27-inch, intended for non-pressure service, shall comply with ASTM F 679, with T-1 wall thickness and a minimum pipe stiffness of 46 psi. Joints and gaskets shall comply with ASTM F 477.
3. PVC pressure pipe and fittings for force mains or gravity sewers shall conform to the Technical Specifications section headed "Piping Materials: PVC Pressure Pipe." Fittings shall be PVC or ductile iron as specified, as directed by the Engineer.
4. High Density Polyethylene (HDPE) profile wall pipe, and Corrugated High Density Polyethylene (CHDPE) pipe for gravity sewers shall conform to the Technical Specifications section headed "Piping Materials: Miscellaneous."
5. High Density Polyethylene (HDPE) pressure pipe for force mains shall conform to the Technical Specifications section headed "Piping Materials: Miscellaneous."
6. Fiberglass Reinforced Polymer Mortar Pipe (FRPMP) for micro-tunneling (18-inch and larger) and gravity sewer mains (28-inch through 48-inch) shall conform to Technical Specifications section headed "Piping Materials: Miscellaneous."

B. Other Materials

1. Castings for manholes and cleanouts shall be cast iron of the sizes, shapes, and catalog references shown on the Plans. Where no reference is made on the Plans, castings shall be equivalent in quality to those manufactured by U.S. Foundry. Unless otherwise noted, all castings shall be designed for an HS-20 truck loading. Castings shall be marked "Sanitary Sewer."
2. Concrete, reinforcing, and masonry for precast, cast-in-place, or site assembled manholes and structures shall conform to the Technical Specifications section headed "Concrete, Masonry, and Reinforcing Steel."
3. Precast manholes shall be manufactured as specified herein and in accordance with the sizes and details shown on the Plans, and with the approved shop drawings.
4. Fiberglass Reinforced Polyester (FRP) manholes shall be manufactured in accordance with ASTM D 3753, the sizes and details shown on the Plans, and the approved shop drawings.

10.04 CONNECTIONS TO EXISTING SANITARY SEWERS

The Contractor shall connect new sanitary sewers to existing sanitary sewers as shown on the Plans and as specified.

All connections to existing sanitary sewers shall be by Flex-Seal Adjustable Repair Coupling Series

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MR-ARC with Series 316 stainless steel shear rings as manufactured by Mission Rubber Company or approved equal. All couplings shall be centered between pipe ends and shall be tightened at both ends by Series 316 stainless steel clamps or approved equal.

The Engineer shall be notified at least 2 working days prior to making final connections. The time at which the connections are to be made shall be subject to approval by the Engineer.

10.05 CONSTRUCTION OPERATIONS

Pipes shall be laid in open cut, except when another method, such as jacking, augering, directional drilling, or tunneling, is shown on the Plans, specified, or ordered.

- A. No excavations shall be left open over a weekend. All pavement openings shall be completely repaired within 7 days of opening.
- B. Sanitary sewers may be constructed in short tunnels to protect trees, shrubs, and existing surface or subsurface utilities and structures. Short tunnels shall be constructed to the lengths shown on the Plans, specified, or directed by the Engineer. No separate payment will be made for short tunnels.
- C. Temporary fences, where required, shall be "wood and wire fence" or other suitable fencing as approved by the Engineer.
- D. In the course of the Work, it will be necessary to install the sanitary sewer under or closely adjacent to existing culverts and other storm and water main facilities. Where so indicated on the Plans, the Contractor shall remove storm drains to permit construction of the sanitary sewer and shall then reconstruct the storm drain. Where removal and reconstruction are not indicated on the Plans, the Contractor shall protect all existing storm and water main facilities which are shown on the Plans or located in the field during the course of the Work.
- E. Sewers crossing water mains may be required to be constructed of ductile iron pipe, PVC pressure pipe, or heavy wall PVC pipe (SDR 26) as ordered by the Engineer, to conform to DEP and Pinellas County Public Health Unit requirements.

Sanitary sewers and service laterals which cross under the new water pipe with less than 18 inches clear vertical separation, or which cross over the new water pipe, shall be replaced with ductile iron pipe or PVC pressure pipe, or heavy wall PVC pipe (SDR 26) for 10 feet on both sides of the new water main, or as directed by the Engineer.

- F. All ground surfaces disturbed by the Contractor shall be restored to their original condition in conformance to City Standards and to the Technical Specifications section headed "Surface Restoration."
- G. Sanitary sewers shall not be cut or pumped around without an approved sanitary sewer pump-around plan and submittal of same, a minimum of 72 hours prior to implementation, to the Water Resources Department Dispatch, 893-7261. The pump-around plan shall include size of pipes and pumps, and discharge location.

10.06 LAYING AND JOINTING PIPELINES

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- A. Ductile iron pipelines, PVC pressure pipelines, and HDPE pressure pipelines for force mains shall be laid and jointed as specified in the Technical Specifications section headed "Pressure Pipe Construction." Retainer glands used for PVC force mains shall be UL listed or FM approved and shall have factory certification for pressures up to 188 psi.
- B. PVC, concrete, and FRPMP gravity pipelines shall be laid in conformance to applicable requirements of ASTM C 12 for concrete pipe, ASTM D 2321 for PVC pipe, and ASTM D 3262 and D 4161 for FRPMP.
- C. **Line and Grade:** Sewers shall be laid to exact line and grade using approved methods consistent with common practice and approved by the Engineer. All line and grade controls shall be furnished by the Contractor.
- D. **Pipe:** Before the pipe is jointed in the trench, the outside of the spigot end and the inside of the bell shall be thoroughly cleaned, wiped, and brushed out to ensure that no dirt or foreign material gets into the finished line. Each pipe shall be inspected for defects and cracks prior to being lowered into the trench. Any cracked or otherwise rejected pipe shall be immediately removed from the site. All pipeline work must be performed in the presence of the Engineer. When work is not in progress, water shall be kept out of the pipe, and the pipe shall be kept closed by means of a test plug.
- E. **Service Connections:** Service lateral connections shall conform to City Standard Details and shall be installed as indicated or as directed by the Engineer. The Contractor shall locate and record the exact position of such service lateral connections and include actual data on the As-Built Drawings to be furnished to the City.
- F. **Watertight Plugs:** Watertight plugs of an approved type shall be installed in the ends of all pipe at times when pipe laying is not in progress or as ordered to prevent any contaminated material or vermin from entering the pipe.
- G. Excavation and backfilling shall conform to the Technical Specifications section headed "Excavation and Backfill."

10.07 MANHOLE CONSTRUCTION

- A. **Brick Manholes:** Brick manholes shall be constructed in accordance with the details shown on the Plans and these Specifications. Twenty-four hours shall elapse between the pouring of the slab and the beginning of laying the brick work.
 - 1. **Base Slabs:** Bases shall be cast in place on a level, compacted trench bottom.
 - 2. **Mortar:** Brick shall be laid in mortar that has been machine mixed for a minimum of 1.5 minutes before water is added, and then mixed until a homogeneous mixture is obtained. Mortar of improper consistency and/or partly set shall not be used in the Work. The brick shall be laid with 3/8-inch nominal mortar joint, and care shall be taken to produce true and smooth alignments, particularly for the inside surfaces.
 - 3. **Brick:** Clay brick shall be as specified in the Technical Specifications section headed "Concrete, Masonry, and Reinforcing Steel."
 - 4. **Exterior and Interior Brick Surface:** Exterior and interior brick surface of manholes shall be given a 3/4-inch application of cement plaster. This plaster shall be the same type mix

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as the mortar in which the bricks are laid, and it shall be applied in 2 applications. Any visible seepage through the manhole walls shall be corrected by the Contractor.

5. **Inverts:** Inverts shall be formed using poured-in-place concrete conforming to the Technical Specifications section headed "Concrete, Masonry, and Reinforcing Steel" and shall have a minimum strength of 2,500 psi. Invert pipe (stub out) shall not extend more than 6 inches outside manhole walls (as measured to back of bell), and shall be grouted with the same mortar used for making mortar joints.
 6. **Exterior Epoxy Coating:** A protective coal tar epoxy coating of Carbolite (formerly Kop-Coat) Bitumastic 300-M, or approved equal, shall be applied to the exterior surfaces of manholes. One coat shall be applied to the outside and shall yield a final dry film thickness of 9 mils.
 7. **Interior Cementitious Coating:** A dense and durable concrete lining of 100 percent pure fused calcium-aluminate cementitious lining of SewperCoat PG as manufactured by Kerneos Inc., shall be applied in accordance with manufacturer's recommendations, to all interior surfaces of manholes including walls, benches, flow channels, and inverts. Lining shall have a final minimum thickness of 1/2 inch.
 8. **Manhole Wall Penetrations:** New brick manholes shall have a grouting ring. New wall penetrations and repair penetrations, for connections to existing manholes, shall be core-drilled and a grouting ring shall be installed. Grouting ring shall be WS Series Waterstop Grouting Ring as manufactured by Press-Seal Gasket Corporation or Engineer approved equal. Installation shall be in accordance with manufacturer's recommendations. Non-shrink grout shall comply with ASTM C 1107. Material shall be 1107 Advantage Grout manufactured by Dayton Superior, Burke Multi-purpose Grout as manufactured by Burke Company, or approved equal.
- B. Precast Concrete Manholes:** Precast manholes shall be constructed in accordance with the details shown on the Plans. Full shop drawing information including design, materials, fabrication details, and installation methods of the proposed precast manholes shall be submitted to the Engineer as specified.
1. **Base Slabs:** Base slabs for precast manholes 48-inch in diameter shall have a minimum thickness of 8 inches as detailed on the Plans. The diameter of the base slab shall be as detailed on the Plans. Reinforcement shall be placed with 2 inches of concrete cover over the top row of steel. Base slabs for precast manholes shall be cast with the lower manhole section and placed on a level, compacted trench bottom.
 2. **Riser Sections:** Riser sections, grade rings, and tops shall comply with ASTM C 478 with the exception that Article No. 11 shall be deleted. Base riser sections shall be provided with preformed pipe holes to fit the connectors. The tops of pipe holes shall not be within 4 inches of the bell or socket portion of the riser.
 3. **Riser Joints:** Riser joint shall conform to ASTM C 443, to the manufacturer's recommendations and as shown on the Plans. Riser shall be jointed with rubber, plastic, or preformed bituminous joint sealing compound equal to Ram-Nek as manufactured by K.T. Snyder.
 4. **Manhole Sizes:** Manhole sizes up to 10 feet in depth (invert to bottom of brick adjustment ring) shall be a minimum of 48-inch inside diameter for 18-inch diameter and smaller pipe. Manholes over 10 feet in depth shall be the specified diameter for a minimum of 6 feet

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above the manhole invert; the remaining portion may, at the Contractor's option, be reduced to 48-inch diameter. In no case shall the manhole diameter be less than that required to adequately enclose the sewer pipe.

5. **Tops:** Tops shall have a minimum opening 24 inches in diameter for pipes 18-inch and smaller and 32-inch minimum for pipes 21-inch and larger, with an 8-inch wide flange at the top. For Type I manholes, only concentric cones are acceptable.
 6. **Top Grades:** Top grades of precast manholes shall be established so that a minimum of 3, but no more than 6, courses of brick are placed under the ring and cover casting.
 7. **Inverts:** Inverts shall be formed using poured-in-place concrete conforming to the Technical Specifications section headed "Concrete, Masonry and Reinforcing Steel" and shall have a minimum strength of 2500 psi.
 8. **Drop Inlets:** Drop inlets shall be provided where directed by the Engineer or shown on the Plans, and such drop inlets shall conform to details shown on the Plans.
 9. **Exterior Epoxy Coating:** Coating shall be applied to the outside surfaces of precast manholes as specified for brick manholes.
 10. **Interior Cementitious Coating:** Coating shall be applied to the inside surfaces of precast manholes as specified for brick manholes.
 11. **Manhole Wall Penetrations:** Manhole wall penetrations for precast manholes shall be as specified for brick manholes.
 12. **Pipe-to-Manhole Connections (for New Precast):** Pipe-to-manhole connections shall be made with a flexible watertight connector such as Kwik Seal or PSX: Positive Seal as manufactured by Press-Seal Gasket Corporation, or Kor-N-Seal I connectors for pipe sizes up to 15-inch and Kor-N-Seal II connectors for pipe sizes 15-inch through 30-inch as manufactured by NPC Inc. Pipe-to-manhole connection shall be installed by the precaster for new manholes, unless specified otherwise.
- C. **Fiberglass Reinforced Polyester (FRP) Manholes:** The construction of FRP manholes shall conform to the details on the Plans. Full shop drawing information including design, materials, fabrication details, and installation methods of the proposed fiberglass manholes shall be submitted to the Engineer as specified.

FRP manhole shall be a one piece unit consisting of a watertight base and corbel section with a concentric cone, as manufactured by LF Manufacturing, Containment Solutions, or an approved equal.

A minimum wall thickness of 0.318 inch shall be used for 48-inch diameter manholes. A minimum wall thickness of 0.50 inch shall be used for manholes larger than 48-inch diameter.

All manholes shall have a U/V inhibitor that is homogeneous with the resin mixture.

All FRP manholes shall have a minimum 20 year manufacturer=s warranty against corrosion and structural defects.

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All FRP manholes shall have a minimum AASHTO HS-20 axle loading.

1. **Base Slabs:** FRP manhole base slabs shall be precast or cast-in-place concrete and shall conform to the thickness specified in the details on the Plans. Cast-in-place concrete base slab reinforcement shall be placed with 3 inches of concrete cover in accordance with the Technical Specifications section headed "Concrete, Masonry, and Reinforcing Steel."

Cast-in-place base slabs for FRP manholes shall be cast in place on a level, compacted bottom.

2. **Watertight Bottom:** The FRP manhole shall have a resin fiber-reinforced bottom and a 2 and 1/2-inch-wide anti-floatation flange as a homogeneous part of the bottom section. The manhole bottom shall be a minimum 1/2-inch thick.

For FRP manhole depths greater than 10 feet, the manufacturer shall install a minimum of two 1 and 1/2-inch-deep by 3 and 1/2-inch-wide stiffening ribs. Stiffening ribs shall be completely enclosed with resin fiber-reinforcement.

3. **Anchors and Washers:** FRP manholes shall be anchored to the cast-in-place concrete base slab with 316 stainless steel Kwik Bolt II Wedge anchors and washers as manufactured by Hilti, or approved equal. The size, number of anchors, and embedment depth shall be as shown on the Plans. The anchors shall be installed a minimum of 1 and 1/2 inches from the outer edge of the anchoring flange and shall be equally spaced around the circumference of the manhole bottom.

4. **Manhole Height:** No fiberglass manhole shall have less than 4 feet clear inside height (measured from invert of bench to finished grade.)

5. **Inverts:** Inverts shall be as shown on the Plans.

A concrete invert may be formed in the field using poured-in-place concrete conforming to the Technical Specifications section headed "Concrete, Masonry, and Reinforcing Steel" and shall have a minimum strength of 2,500 psi.

6. **Stub Outs:** FRP stub outs shall be installed as shown on the Plans or directed by the Engineer, in accordance with approved shop drawings.

Pipe-to-manhole connectors for new manholes shall be installed by the FRP manhole manufacturer, unless specified otherwise. Connections for 4-inch through 15-inch pipe shall be made with a Kor-N-Seal boot as manufactured by NPC Inc., or approved equal, and laminated sleeve, as shown in the details on the Plans. Connections of 18-inch and larger shall be with a Link-Seal connector as manufactured by Pipeline Seal & Insulator Inc., or approved equal, and laminated sleeve as shown on the details on the Plans.

Laminated sleeves shall be formed using resin and fiberglass of same type and grade as used in the fabrication of the fiberglass manhole. Laminated sleeves may be factory installed or field installed. Field installation shall be by a manufacturer's certified representative or a Contractor-certified person.

All holes cut into the FRP manhole shall be by core methods recommended by the manhole manufacturer. A minimum of 12-inch clear wall between cutouts shall be maintained in all directions for each cored hole.

10.08 TESTING OF SEWER PIPELINES

A. Pressure Pipelines

Pressure sanitary sewer pipelines shall be tested in accordance with the applicable requirements of the Technical Specifications section headed "Pressure Pipe Construction." Pressure sanitary sewer pipelines shall not be disinfected.

B. Gravity Pipelines

1. Gravity pipelines shall be tested for infiltration, exfiltration, deflection, or low pressure air test, at the Engineer's direction. The Contractor shall provide a closed circuit television video camera inspection, in the presence of the City (or engineer) for all sanitary sewer pipe repairs and all new sanitary sewer construction. The video tape, CD, or DVD shall include time and date, footage, and audio describing any pipe abnormality; also, a CCTV inspection log shall be provided with each completed inspection. Any sewer pipeline found to be unacceptable by the Engineer shall be corrected, repaired, or replaced as directed by the Engineer, at no additional cost to the City.
2. **Infiltration Test:** Upon completion of a section of sewer line, a test for infiltration shall be conducted as directed by the City Inspector. Dewatering of the line to be tested shall terminate at least 2 days prior to the infiltration test. The maximum infiltration allowed in a 24-hour period shall not exceed 200 gallons per inch of diameter per mile of sewer from any section between successive manholes. If the infiltration exceeds the allowable limits, the line shall be further checked and repaired by the Contractor until the infiltration requirements have been met. If any particular location indicates concentrated infiltration, such location shall be investigated and corrected regardless of the overall infiltration requirement.

Groundwater level measuring pipes shall be installed at manholes. The groundwater level shall be measured prior to testing. If the groundwater level is at least 2 feet above the highest section of the work being tested, infiltration methods of measurement shall be used. If there is insufficient groundwater head to perform infiltration testing, exfiltration tests will be made.

3. **Exfiltration Test:** If, in the opinion of the City Inspector, the position of a sewer line is above the normal groundwater table, the Engineer may direct the Contractor to perform an exfiltration test. The maximum allowable exfiltration during a 24-hour period shall not exceed 200 gallons per inch of diameter per mile of sewer from any section between successive manholes. An allowance of an additional 10 percent of gallonage shall be permitted for each additional 2 feet of head over a basic 2-foot minimum internal head.

The exfiltration test shall be performed by plugging the upstream and downstream manholes of the test section, filling the line with water, and maintaining a minimum of 2 feet head of water in the section of line being tested. The rate of exfiltration shall be calculated from the water level drop in the upstream manhole during the 24-hour test period.

4. **Low pressure air test:** At the direction of the City Inspector or Engineer, each pipeline reach may alternatively be tested with air pressure (minimum 3.5 psi, maximum 5 psi) in accordance with UNI-BELL UNI-B-6-98 "Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe." The system passes the test if the pressure drop due to

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leakage through the pipe or pipe joints is less than or equal to 0.5 psig over the time period described below.

Minimum time period for a 0.5 psig pressure drop

The time period for the test shall be calculated from UNI-B-6-98 as follows:

- T = 28.33 DK,
- T = Shortest time, in seconds allowed for the air pressure to drop 0.5 psig,
- K = .000419 DL, but not less than 1.0,
- D = Nominal pipe diameter in inches, and
- L = Length of pipe being tested in feet.

5. **Deflection Test:** Prior to final acceptance of the Project, all PVC pipelines shall be deflection tested. The Contractor or a City-approved test lab shall perform the deflection testing at the expense of the Contractor. The deflection test shall be performed a minimum of 7 days after the base has been compacted and sealed.

The PVC pipe/soil system has been designed so that the maximum installed deflection does not exceed 5 percent and 7.5 percent of the base inside diameter of the pipe as listed in the following table:

<u>Nominal Size</u> (inches)	<u>Base Inside Diameter</u> (inches)	<u>5% Deflection After 7 Days Mandrel</u> (inches)	<u>7.5% Deflection after 30 Days Mandrel</u> (inches)
ASTM D 3034 SDR-26			
8	7.488	7.11	6.93
10	9.342	8.87	8.64
12	11.102	10.55	10.27
15	13.575	12.90	12.56
ASTM F 679 TYPE T-1			
18	16.976	16.13	15.70
21	20.004	19.01	18.50
24	22.480	21.36	20.79
27	25.327	24.06	23.43
ASTM F 679 TYPE T-2			
18	17.054	16.20	15.77
21	20.098	19.09	18.59
24	22.586	21.46	20.89
27	25.446	24.17	23.54

The Contractor shall have the option of testing for 5 percent deflection after the base has been compacted and sealed for 7 days; or for 7.5 percent deflection after the base has been compacted and sealed for 30 days.

If the pipe fails the 7-day, 5 percent deflection test, the Contractor shall immediately conduct a 7.5 percent deflection test. If the pipe passes the 7.5 percent deflection test, the Contractor has the option of repairing that section at that time or waiting until a minimum of 30 days after the base has been compacted and sealed and then re-testing for a maximum of 7.5 percent deflection.

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If the pipe fails the 7.5 percent deflection test after 7 days or at 30 days, the Contractor shall repair that section immediately.

If the Contractor performs the deflection testing rather than employing a City-approved test lab, the following shall apply:

- a. The Contractor shall furnish the mandrel, labor, materials, and equipment necessary to perform the tests as approved by the Engineer. The mandrel shall be pulled through by hand or a hand operated reel in the presence of the Engineer. Prior to performing the deflection tests, the Contractor shall submit to the Engineer certification that the 9-arm mandrels are preset as stated above. Each mandrel shall be engraved with the following:
 - Serial Number
 - Nominal Pipe Diameter
 - Either "ASTM D 3034" year, "SDR-26", or "ASTM F 679" year; and either "Type T-1" or Type T-2"
 - Percent deflection as stated above
- b. If the mandrel fails to pass any section of pipe, the Contractor shall excavate and make all repairs (section replacements) necessary to correct the excessive deflection. The Contractor shall then backfill, re-compact, reseal the permanent pavement base, and retest the line. If the mandrel fails to pass a second time, the affected section shall be replaced. Re-rounding shall not be permitted.

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SECTION 11 - STORM DRAINAGE CONSTRUCTION

11.01 GENERAL

The Work in this section includes construction of storm drains (sewer pipes), inlets, manholes, special structures, shallow drains, storm water treatment facilities, and other miscellaneous construction related to collection, transportation, and treatment of storm water.

Excavation, backfill, concrete, concrete piping, and other miscellaneous materials are specified in other sections of these Specifications.

Standard details, including limited specifications, are detailed on the Plans.

Standards referenced in this section are the latest revision of the following specifications:

AASHTO T 180	"Moisture-Density Relations of Soils Using a (4.5-kg) 10-lb Rammer and an (457-mm) 18-in. Drop"
DOT-SSRBC Section 104	"Prevention, Control, and Abatement of Erosion and Water Pollution"
DOT-SSRBC Section 425	"Inlets, Manholes, and Junction Boxes"
DOT-SSRBC Section 430	"Pipe Culverts and Storm Sewers"
DOT-SSRBC Section 440	"Underdrains"
DOT-SSRBC Section 449	"Precast Concrete Drainage Products"
DOT-SSRBC Section 524	"Concrete Ditch and Slope Pavement"
DOT-SSRBC Section 901	"Coarse Aggregate"
DOT Standard Index No. 103	"Turbidity Barriers"

11.02 DATA TO BE SUBMITTED

The Contractor shall furnish shop drawings for the following, in conformance with the *General Conditions*, Article 36:

Piping materials and gaskets	Underdrain aggregate
Concrete	Fine filter aggregate
Reinforcing	Impervious liner
Precast structures	Filter fabric
Castings	External pipe sealing bands
	Non-shrink grout

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11.03 MATERIALS

- A. **Reinforced** concrete, precast and cast-in-place concrete, and masonry shall conform to the Technical Specifications section headed "Concrete, Masonry, and Reinforcing Steel."
- B. **Concrete pipe** shall conform to the Technical Specifications section headed "Piping Materials: Concrete Gravity Pipe."
- C. **Perforated pipe** for roadway underdrains shall conform to the Technical Specifications section headed "Piping Materials: Miscellaneous."
- D. **Aggregate** for roadway underdrains shall conform by gradation to stone Size No. 7 or 89 as set forth in DOT-SSRBC Section 901. Sand or limerock will not be acceptable as a filter aggregate.

Aggregate for roadway underdrains other than that previously specified will be considered by the City provided a complete description as to material, gradation, and location of source is submitted to the Engineer for approval.

- E. **Filter fabric** for underdrains shall be equal to Mirafi 140N filter fabric.
- F. **Fine filter aggregate** for stormwater filtration systems as required by SWFWMD shall be washed material, i.e., clean creek gravels, and silica sand; or mixtures thereof with less than 1 percent silt, clay, and organic matter. This filtration media must have a uniformity coefficient between 1.5 and 2.0, and an effective grain size of 0.40 to 0.55 millimeters. The vertical permeability rate (K) shall be at least 130 feet per day when compacted to 98 percent of maximum density by AASHTO T 180.

Florida limestone is not acceptable as a filter media and shall not be used.

The Contractor shall submit a sample of fine filter aggregate and location of source to an approved private soil lab. The soil lab must have a Professional Engineer certify compliance of the material with DOT and City specifications. After lab tests are completed, the Contractor shall submit to the Engineer a sample of fine filter aggregate, location of source, and certified test results of the uniformity coefficient, effective grain size, and permeability test. Fine filter aggregate must be approved by the Engineer, based on test results, prior to delivery to the site. The same approval procedure shall be followed for each 20 cubic yards of fine filter aggregate supplied.

- G. **Castings** shall be cast iron of the sizes, shapes, and catalog references shown on the Plans. Where no reference is made on the Plans, castings shall be equivalent in quality to those manufactured by U.S. Foundry. Unless otherwise noted, all castings shall be designed for an HS-20 truck loading.

11.04 INLETS AND MANHOLES

- A. **Inlets, catch basins, and manholes** shall be precast concrete or cast-in-place concrete. The construction of catch basins, manholes, and inlets, including modifications shown on the Plans, shall conform to the applicable requirements of DOT-SSRBC Section 425, DOT-SSRBC Section 449 and the Plans. Precast Type I, I-M, I-M2, or Type II catch basins and inlets or inlet risers shall be permitted provided the top 24 inches of the catch basin or inlet is constructed of cast-in-place concrete. Shop drawings of such structures shall be submitted for review.
- B. **Concrete brick** construction shall not be permitted except for Type I and Type II manholes, or grate inlets where shown on the Plans or approved by the Engineer. Concrete brick shall conform to the Technical Specifications section headed "Concrete, Masonry, and Reinforcing Steel."
- C. **Manhole** construction shall conform to the applicable requirements of DOT-SSRBC Section 425, DOT-SSRBC Section 449 and as shown on the Plans.
- D. **Catch basin modifications** Type "M" ("shelf" or "wing") shall be added to existing catch basin structures at locations indicated on the Plans or as directed by the Engineer.
- E. **Catch basin adjustment** for adjustment of existing catch basin structures shall be made at locations indicated on the Plans or where required. These adjustments shall include the raising or lowering of throat grade and top of cover (top slab) grade, the installation of new catch basin cover(s) top slab(s), castings, and all other adjustments required to conform the existing structure to the proposed curb grade.
- F. **Conversion of existing structures**, including converting existing catch basins and/or junction boxes to manholes, shall be constructed at locations shown on the Plans. Dimensions and materials for each conversion shall be individually determined in the field to accommodate existing conditions, and shall include the adaptation of standard manhole rings and covers.
- G. **Pipe** that must be shortened shall be neatly sawcut at junctions with structures. The void between the pipe and the structure shall be filled with non-shrink grout to provide a watertight seal. The outlet pipe shall be recessed 2 –inches from the inside wall face and grouted around the perimeter to make a smooth flow transition. The inlet pipe shall be cut flush at the inside wall.
- H. **Structure sealing** shall be performed in accordance with the City Standard Detail entitled "Precast Structure Joint Assembly and Structure Sealing." Filter fabric shall be installed around the full perimeter of the conduit, and formed and held in place against the structure wall. The fabric shall be installed at all locations where the conduit penetrates the structure wall.

11.05 OTHER STRUCTURES

- A. **Concrete drainage structures**, including endwalls, headwalls, etc., shall be constructed at locations as shown on the Plans and shall conform to DOT-SSRBC Section 449 and details as shown on the Plans.
- B. **Nonstandard concrete drainage structures** shall conform to all applicable requirements of DOT-SSRBC Section 400 and DOT-SSRBC Section 449. The Contractor shall submit all required shop drawings and/or other detail drawings for approval by the Engineer prior to construction.
- C. **Ditch pavement** construction shall be as shown on the Plans, or as directed by the Engineer, and shall conform to applicable provisions of DOT-SSRBC Section 524.

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- D. **Structure sealing** shall be performed in accordance with the City Standard Detail entitled "Precast Structure Joint Assembly and Structure Sealing." Filter fabric shall be installed around the full perimeter of the conduit, and formed and held in place against the structure wall. The fabric shall be installed at all locations where the conduit penetrates the structure wall.

11.06 LAYING PIPE

- A. **Excavation, dewatering, sheeting and backfill** for laying pipe and installation of structures shall conform to the applicable provisions of the Technical Specification section headed "Excavation and Backfill."
- B. **Drain pipes** shall be laid to exact line and grade using Engineer approved devices consistent with common practice. All line and grade controls shall be furnished by the Contractor.
- C. **Laying of pipe** in the trench shall commence promptly as excavation is completed and foundations have been prepared. Proper care shall be used in handling the pipe to avoid injury and damage. Rejected pipe shall be promptly removed from the Work site.
- D. **Pipe laying** shall conform to all applicable requirements of DOT-SSRBC Section 430. Temporary watertight plugs shall be installed in pipe ends at all times when pipe laying is not in progress or as ordered by the Engineer.
- E. **Adjustments** of concrete pipe lengths to accommodate field conditions shall be accomplished by saw cutting. Concrete pipe shall be saw cut flush with the inside walls of manholes and catch basins on the upstream (entrance) side and saw cut and recessed 2-inches and mortared with a smooth rounded flow transition on the downstream (exit) side unless a bell end can be inserted flush into the drainage structure.
- F. **Subsurface drains** shall be installed at locations shown, or at locations determined by the Engineer from field conditions observed during construction as requiring subsurface drains. Installation shall conform to DOT-SSRBC Section 440 and as detailed on the Plans.
- G. **Shallow Storm Drain Construction:** Storm drains to be installed may in some cases encroach into the stabilized base or the base to be constructed as part of the roadway. Extreme caution shall be exercised by the Contractor to protect shallow storm drains during stabilization and base compaction. Where shallow storm drains encroach into the area to be stabilized, the Contractor shall provide extra base material compacted to 98% of maximum density in 3 lifts around the pipe, to a distance of 12 inches horizontally beyond the outside of the pipe, and to the required depth of stabilization or as shown on the Plans. .
- H. **Pipe and/or Culvert Joint Wrap:** All pipe joints, whether round reinforced concrete, fiber reinforced concrete pipe, elliptical reinforced concrete, corrugated polyethylene, or profile wall polyethylene, shall be wrapped with filter fabric wrap or external sealing bands as illustrated on the City Detail for drainage pipe joints.

11.07 WATER QUALITY PROTECTION AND TREATMENT

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- A. **Preserving Water Quality:** The Contractor shall exercise extreme care to minimize degradation of water quality at the site. All necessary provisions shall be taken to ensure compliance with the water quality standards of the State of Florida, Chapter 17-3, Florida Administrative Code. Turbidity shall not exceed 29 NTUs (Nephelometric Turbidity Units) above background level. Adequate silt containment procedures and equipment shall be used to control turbidity at all times.
- B. **Regulatory agency requirements** shall be complied with by the Contractor. The Contractor shall be fully responsible to familiarize himself with requirements of the permits applicable to this Work, as specified in the Technical Specifications section headed "General." Copies of these permits and/or regulations are either contained in the Appendix to these Specifications or are available for review at the office of the City Engineer.

The Contractor shall be fully responsible for preventing erosion and protecting water quality in accordance with permit requirements.

- C. **Stormwater treatment facilities** shall be constructed at the locations shown on the Plans. The Contractor shall complete all aspects of the required stormwater treatment system in accordance with the permit conditions.
- D. **Floating Turbidity Barriers:** The installation, maintenance, and removal of floating turbidity barriers shall be in accordance with DOT-SSRBC Section 104 and DOT Standard Index No. 103. Floating turbidity barriers shall also be used to restrict access to the work area when manatees are present.
- E. **Baled Hay or Straw:** Work shall conform to all applicable requirements of DOT-SSRBC Section 104 and as approved by the Engineer.
- F. **Staked Silt Barriers:** Work shall conform to all applicable requirements of DOT-SSRBC Section 104 and as approved by the Engineer.

11.08 SURFACE RESTORATION AND MISCELLANEOUS

- A. All surfaces disturbed by the Contractor shall be restored to their original condition in conformance to City Standards and to the Technical Specifications section headed "Surface Restoration."
- B. Existing catch basins, grate inlets, endwalls, manholes, and junction boxes shall be removed from locations where these facilities are shown on the Plans to be removed, are in conflict with new construction, or are to be abandoned under new road construction. Such removal shall include the off-site disposal of said structure, and when required, backfilling and the patching or plugging of existing outlet pipe.
- C. All castings and grates removed from existing catch basins, inlets, endwalls, headwalls, and junction boxes shall be salvaged by the Contractor and returned to the City at the City Utilities Complex, as directed by the Engineer.

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SECTION 12 - PRESSURE PIPE CONSTRUCTION

12.01 GENERAL

The Work in this section includes construction of potable water mains, reclaimed water mains, sanitary force mains, and appurtenances.

Pressure pipelines are to be constructed at locations shown on the Plans. The City reserves the right to make minor changes in grade and/or alignments as the Work progresses.

Piping materials for pressure pipe installations shall be as follows:

Potable Water Main

PVC Pipe	2-inch	
DI Pipe	6-inch and larger	
HDPE Pipe	2-inch and larger	ASTM D3350 meeting PE 3608 code designation
Galvanized Pipe	2-inch blow-off assemblies, 2-inch connections, 2-inch short tunneling, and 2-inch short relocations	
Fittings	2-inch PVC pipe: 2-inch galvanized pipe: 6-inch and larger pipe:	PVC with gasketed joint Galvanized steel with threaded joint Ductile Iron (DI) with push-on or mechanical joint

Reclaimed Water Main

PVC Pipe	2-inch through 12-inch	
DI Pipe	16-inch and larger	
HDPE Pipe	2-inch and larger	ASTM D3350 meeting PE 3608 code designation
Fittings	2-inch PVC pipe: 2-inch galvanized pipe: 4-inch and larger pipe: HDPE pipe:	PVC with gasketed joint Galvanized steel with threaded joint DI with push-on or mechanical joint DI with HDPE mechanical joint adapter

Sanitary Force Main

PVC Pipe	4-inch through 12-inch: 14-inch through 36-inch:	ANSI/AWWA C900 ANSI/AWWA C905
DI Pipe	14-inch and larger pipe:	ANSI/AWWA C151
HDPE Pipe	2-inch and larger	ASTM D3350 meeting PE 3608 code designation

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PVC Fittings	4-inch through 12-inch pipe: 14-inch through 36-inch pipe:	C900 – push-on or mechanical joint C905 – push-on or mechanical joint
DI Fittings	4-inch and larger pipe:	DI with push-on or mechanical joint
HDPE Fittings	2-inch and larger pipe:	DI with HDPE mechanical joint adapter

All existing water services shall be kept in service during the construction of water mains and the preparation of new service connections. Water meters requiring disconnection by the Contractor to accomplish the Work shall be promptly restored to service by the Contractor. The Contractor shall give a minimum of 24 hours prior written notice to all affected City water customers of the intended service interruption.

All pipe, fittings, and appurtenances shall be furnished by the Contractor and be transported, delivered, and installed by the Contractor in accordance with the requirements of the subsection headed "Laying and Jointing Pipelines." Fire hydrants will be furnished by the City, as specified.

All pipelines shall be tested in accordance with the requirements of the subsection headed "Testing and Disinfection of Pressure Pipelines: Pressure Test."

All potable water and reclaimed water pipelines shall be disinfected before they are put into service as specified in the subsection headed "Testing and Disinfection of Pressure Pipelines: Disinfection."

As-built drawings shall be submitted to the Engineer prior to acceptance of the Work and prior to commencement of the warranty period.

Standards referenced in this Section are the latest revision of the following specifications:

ANSI/AWWA C105	"Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids"
ANSI/AWWA C110	"Ductile-Iron and Gray-Iron Fittings, 3-Inch through 48-Inch"
ANSI/AWWA C111	"Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings"
ANSI/AWWA C151	Ductile-Iron Pipe, Centrifugally Cast
ANSI/AWWA C504	"Rubber-Seated Butterfly Valves"
ANSI/AWWA C509	"Resilient-Seated Gate Valves for Water and Sewerage Systems"
ANSI/AWWA C515	"Reduced Wall, Resilient-Seated Gate Valves for Water Supply Service"
ANSI/AWWA C550	"Protective Epoxy Interior Coating for Valves and Hydrants"
ANSI/AWWA C600	"Installation of Ductile-Iron Water Mains and Their Appurtenances"
ANSI/AWWA C605	"Underground Installation of PVC Pressure Pipe and Fittings for Water"
ANSI/AWWA C651	"Disinfecting Water Mains"
ANSI/AWWA C800	"Underground Service Line Valves and Fittings"

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ANSI/AWWA C900	"Polyvinyl Chloride (PVC) Pressure Pipe, 4-Inch through 12-Inch, for Water Distribution"
ANSI/AWWA C901	"Polyethylene (PE) Pressure Pipe and Tubing, 1/2-Inch through 3-Inch for Water Service"
ANSI/AWWA C905	"Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings 14-Inch through 48-Inch, for Water"
ANSI/AWWA C906	"Polyvinyl Chloride (PVC) Pressure Pipe and Fittings 4-Inch through 63-Inch, for Water Distribution and Transmission"
ANSI/AWWA C901	"Polyethylene (PE) Pressure Pipe and Tubing, 1/2-Inch through 3-Inch for Water Service"
ASTM A 126	"Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings"
ASTM D 429	"Test Methods for Rubber Property - Adhesion to Rigid Substrates"
ASTM D 3139	"Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals"

12.02 DATA TO BE SUBMITTED

The Contractor shall submit shop drawings in accordance with the *General Conditions* Article headed "Shop Drawings and Submittals."

- Pipe
- Valves
- Joints and joint accessories
- Fittings
- Specials and accessories
- Special linings and coatings
- Water service materials

12.03 MATERIALS

All pressure pipe materials shall be in accordance with the applicable requirements of the Technical Specifications sections headed:

DIP	"Piping Materials: Ductile Iron Pipe"
HDPE	"Piping Materials: Miscellaneous"
PVC	"Piping Materials: PVC Pressure Pipe"

All pressure pipe materials (pipe, fittings, valves, valve boxes, tapping valves and sleeves, precast thrust blocks, blow-offs, house services, etc.) except fire hydrants, shall be furnished by the Contractor. All pressure pipe fittings and valves shall be cast and manufactured in the United States of America unless complete certification is furnished in accordance with ANSI/AWWA C110.

Fire hydrants will be issued to the Contractor at the Consolidated Inventory Warehouse, located at the City Utilities Complex, 327 17th Street North, St. Petersburg, upon presentation of a requisition

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signed by the Engineer. The Contractor shall furnish all labor and equipment necessary to load, deliver, and unload the fire hydrant(s). The Contractor shall furnish a minimum of 2 workers to load trucks. The details of loading procedures shall be as directed by the Engineer. No fire hydrant shall be issued or returned without a written directive from the Engineer.

All salvaged castings and pressure pipe materials will remain the property of the City of St. Petersburg unless specifically waived by the Engineer, in writing, and shall be carefully salvaged by the Contractor and delivered by the Contractor to the City Utilities Complex Yard. All items so waived shall become the Contractor's property and shall be removed from the site by the Contractor.

All materials furnished shall be new. Materials not specified herein or on the Plans shall conform to AWWA Standards and Industry Standards.

Piping, concrete, masonry, and all other materials shall conform to those materials as specified in the appropriate Technical Specifications sections for those materials. Specific pressure pipe and appurtenances materials shall conform to the following specifications:

A. 2-Inch Diameter Pipe

1. Steel pipe shall be standard galvanized steel, Schedule 40, furnished in 21-foot lengths with both ends threaded.
2. All 2-inch steel fittings shall have screw type joints.
3. Pipe thread compound shall not be used. Threads shall be wrapped with Teflon joint tape, non-hardening, Mil. Spec. T27730A. Cutting oils shall be dark, non-toxic, and equal to cutting oil manufactured by the Rigid Tool Company. The Contractor shall take caution not to allow cutting oil inside the pipe, and shall remove all cuttings. Cutting oils shall be UL listed or NSF approved for use in potable water systems.
4. PVC pressure pipe to be used in the potable water system shall be Safety Blue in color or white with Safety Blue identification tape or color coded approved ink lettering as specified. PVC pressure pipe to be used in the reclaimed water system shall be Safety Purple in color or white with Safety Purple identification tape or approved color coded ink lettering as specified.

PVC pipe shall conform to the Technical Specifications section headed "Piping Materials - PVC Pressure Pipe."

5. HDPE pressure pipe shall conform to the Technical Specifications section headed "Piping Materials – Miscellaneous."

B. Valves - General

Valves shall be iron body, bronze mounted, and have joint ends as shown or specified. Valves shall have O-ring seals, unless otherwise specified.

A standard 2-inch square AWWA operating nut shall be provided on each valve. Valves shall have non-rising stems and shall open when the nut is turned counterclockwise. Each nut shall be marked with an arrow.

All valves of the same type shall be from the same manufacturer. Parts of valves of the same type and size shall be interchangeable. Unless otherwise specified, all valves shall be designed for a cold water working pressure of 150 psi.

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All valves shall be furnished complete with gaskets, bolts, nuts, and glands necessary for installation.

All valves larger than 2-inch shall have restrained rubber gasketed compression joints, or mechanical joints with retainer glands, conforming to ANSI/AWWA C111, at the Contractor's option unless otherwise noted.

All valves shall be factory lined with an epoxy coating conforming to ANSI/AWWA C550.

Valves used for sanitary force mains shall be the same as those used in other pressure pipe applications, unless otherwise specified.

Upon request, the valve manufacturer shall provide an affidavit of compliance, proof of design testing, and proof of production testing.

C. Valves - Specific

1. **2-Inch Valves:** Valves shall be resilient seated gate valve, cast iron body. Joint ends shall have NPT pipe threads. The minimum stem diameter shall be 0.85 inch.

Valves used with PVC pipe shall be connected to the pipe using thread/push-on adapters with push-on joint conforming to ASTM D 3139, 200 psi pressure rating.

2. **Gate Valves:** 3-Inch gate valves shall be resilient seated, shall meet the requirements of ANSI/AWWA C509, and shall be U.S. Pipe Metro-Seal or approved equal. Gate valves 4-inch through 12-inch shall be resilient seated, shall meet the requirements of ANSI/AWWA C509 or ANSI/AWWA C515, and shall be U.S. Pipe Metro-Seal or approved equal. Valves shall be designed for buried service, with O-ring seals and mechanical joint ends, or push-on joints, at the Contractor's option.

3. **Butterfly Valves:** Valves shall be cast iron body, rubber seated, tight closure, direct burial, and shall conform to the applicable sections of ANSI/AWWA Standard C504, Class 150B. Valve disc shall rotate 90 degrees from full open position to tight shut position, and valve disc shall be of ductile iron or cast iron.

Valve shafts shall be constructed of Type 304 stainless steel; shaft seals shall be designed for standard V-type packing, O-ring seals, or approved equal. If stub shafts are furnished, the shafts shall extend a minimum of 1.5 diameters into the disk.

Valve seats shall be of synthetic or new natural rubber, and shall be either disc-mounted and clamped, or bonded to the valve body according to ASTM D 429, Method B. The mating seat surface shall be constructed of Type 316 stainless steel or approved equal.

Valve actuators shall be designed for buried service and shall be of the traveling nut, self-locking type. Actuators shall be designed to withstand a torque of 450 foot pounds.

4. **Tapping Valves:** Valves 4-inch through 12-inch shall be resilient seated gate valves meeting the applicable requirements of ANSI/AWWA C509 or ANSI/AWWA C515. The valves shall be specially designed for pressure tapping, and shall be U.S. Pipe Metro-Seal, or approved equal.

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Tapping valves 16-inch and larger shall be horizontal gate valves with bypass valve, rollers, and scrapers as specified. Tapping valves shall conform to the applicable provisions of ANSI/AWWA C509 or ANSI/AWWA C515.

Tapping valves shall be furnished with joint accessories and shall include rubber gasket for the tapping flange joint. Tapping valves shall have a full waterway opening capable of passing a full-sized shell cutter. The flange shall have a raised face designed to engage the corresponding recess in the tapping sleeve flange.

5. **Ballcentric Plug Valves:** Plug Valves shall be non-lubricated, eccentric type and designed for a working pressure of 175 psi for valves 12-inch and smaller, and 150 psi for valves 14-inch and larger. Valves 20-inch and smaller shall be round port design. Valves shall be manufactured by Henry Pratt Company.

End connections shall be mechanical joint.

The plug valve body shall be cast iron ASTM A126 Class B with a welded-in overlay of 90% nickel alloy content on all surfaces contacting the face of the plug. Sprayed, plated, nickel welded rings or seats screwed into the body are not acceptable.

The valve plug shall be cast iron ASTM A 126 Class B, with Buna N resilient seating surface to mate with the body seat.

Plug valves shall be furnished with permanently lubricated, sleeve type metallic bearings. Grit excluder seals shall be provided in the upper and lower journals to isolate the bearings.

Plug valves shaft seals shall be the self adjusting type, replaceable without removing the valve bonnet.

Manual gear actuators shall be totally enclosed worm and gear type permanently lubricated. Above ground valves 8-inch and larger shall be provided with gear actuators. Buried valves 6-inch and larger shall be provided with gear actuators.

D. Tapping Sleeves

Sleeves shall be cast iron, ductile iron, or fabricated steel. Iron body tapping sleeves shall have standard mechanical joint ends and shall be complete with necessary nuts, bolts, gaskets, and glands. Tapping sleeves shall be suitable for installation on centrifugally or pit cast iron pipe (Class A-B or C-D).

All iron body tapping sleeves shall be U.S. Pipe T-9 tapping sleeve or approved equal.

Steel fabricated tapping sleeves epoxy coated with stainless steel nuts and bolts may be used when the tapped line is larger than the tapping diameter (i.e., 12 x 8 allowed, 12 x 12 not allowed). Fabricated tapping sleeves for DI pipe and PVC pipe shall be Smith-Blair 622 or approved equal.

Tapping sleeves shall have a 3/4-inch NPT test plug for pressure testing.

Taps for 2-inch connections shall be installed using a service saddle clamp as described in these Specifications.

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E. Valve Boxes

Valves to be buried in the ground shall be provided with cast iron valve boxes. The valve boxes shall be of proper size to fit over the valve bonnets and extend slightly above the finished ground surface or flush with pavement or sidewalk. The tops shall be complete with stay-put cover.

Valve boxes for potable water system shall be adjustable slip type valve box and cover such as Series 6855 manufactured by Tyler Utilities, or Russco, Universal Part No. 461-A,, or approved equal, and the cover shall be marked "WATER."

Valve boxes for reclaimed water system shall be Russco, Bottom Part No. VB4612X and Top Part No. VB2503L (a slip type bottom with a screw type top, lid to be installed unlocked), or approved equal, with a square cover marked "RECLAIMED WATER."

The interior and exterior surfaces of valve boxes shall be coated with asphalt varnish in accordance with ANSI/AWWA C509.

F. Fire Hydrants

Fire hydrants shall be supplied to the Contractor by the City at the Consolidated Inventory Warehouse as specified herein. Hydrants will be furnished for 36-inch, 42-inch, 48-inch, or 54-inch bury (ground line to pipe invert).

G. Corporation Stops

Corporation stops for chlorination and sampling taps, and as air releases, shall be brass and designed for a cold water working pressure of 100 psi. Corporation stops shall be Ford No. F-1000, Mueller Co. H-15008, or approved equal, unless otherwise shown or specified.

H. Meter Boxes:

Meter boxes for use with blow-offs and air releases shall conform to meter boxes as specified for water service materials.

I. Polyethylene Wrapping

Where shown on the Plans or where ordered by the Engineer, new ductile iron pipe pressure pipe, fittings, and valves shall be encased in polyethylene in accordance with ANSI/AWWA C105. Extreme care shall be taken by the Contractor to prevent any damage to polyethylene encasement.

Polyethylene wrapping color shall match applicable color codes. If polyethylene wrapping is of the color specified for identification, the paint strip on DI pipe may be deleted.

J. Water Services Materials

All tubing and appurtenances to be used for water services shall be new and supplied by the Contractor. Unless otherwise specified, all service materials shall conform to ANSI/AWWA C800.

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1. **Tubing:** Tubing shall be polyethylene and meet all requirements of ANSI/AWWA C901, and shall be NSF registered. All polyethylene tubing, fittings, and appurtenances shall be designed, constructed, and installed in accordance with the best practices and methods, and these Specifications.

Tubing shall be cold water service polyethylene tubing made from polyethylene materials and shall be designed for a maximum working pressure of 200 psi at 23°C (73.4°F). The minimum thickness shall be DR9. Tubing shall be marked with size, manufacturer's name, date code, working pressure, PE Code designation PE 3608, and production code. Polyethylene tubing shall be connected to standard flare or compression fittings, corporation stops, curb stops, meters, etc. in accordance with the manufacturer's recommendations.

Polyethylene tubing shall be flexible tubing with physical properties equal to or exceeding those of Carlon HI/MOL polyethylene as manufactured by Carlon Products Corporation, or approved equal.

2. **Service saddle clamps:** Service saddle clamps shall be epoxy coated doublestrap or full circle with corporation thread inlet. They shall be Smith-Blair 317, Smith-Blair 331, or Ford FC202 for use on ductile iron pipe, or shall be Smith-Blair 317, Smith-Blair 372, or Ford FC202 for use on PVC pipe, or approved equal. Service saddle clamps shall be used on PVC pipe for all sizes of service connections. DI pipe may be direct tapped for 1/2-inch, 1-inch, and 1 1/2-inch service connections. Service saddle clamps shall be used for connecting 2-inch pipelines to existing 4-inch and larger pipelines, and shall be as described in these Specifications except that the threaded outlet shall be iron pipe thread.
3. **PVC self-tapping service saddles:** Self tapping saddles may be used for all 3/4-inch and 1-inch service connections to 2-inch and larger PVC pressure pipelines and shall be Continental Water Products' Fasttap or approved equal.
4. **Corporation stops:** Corporation stops 3/4-inch through 1-inch shall be Ford F-1000, Mueller Co. H-15008, or approved equal.
5. **Curb stops:** Curb stops shall be Ford B41 series, Mueller Co. H-15172, or approved equal.
6. **Meter yokes:** Meter yokes shall be Ford Y-202 yoke bar with EC-23 expander and B94-223W ball valve, Mueller Co. H-2020 yoke bar with H-14234 expander and B-24359 ball valve, or approved equal.
7. **Meter boxes:** Meter boxes shall be a "Rome Style" cast iron No. 1 box for 3/4-inch and 1-inch meters as manufactured by Russco, or approved equal; if a larger box is required, it shall be a polymer box 18 1/2 -inch by 39 3/8-inch with cast iron cover as manufactured by CDR Systems Corp., or an approved equal.

12.04 CONNECTIONS TO EXISTING MAINS

The Contractor shall connect the new pressure pipelines to the existing pressure pipelines at locations as shown on the Plans and as specified. The Engineer shall be notified at least 2 working days prior to making connections. The time at which the connections are to be made and the manner of making the connections shall be subject to approval by the Engineer.

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The connections to the existing pressure pipeline shall be made so as to minimize the time during which the existing pressure pipeline will be out of service. The Contractor shall utilize the necessary number of crews and types of equipment, and shall work the necessary hours to ensure completion of the connections within the time specified.

12.05 CONSTRUCTION OPERATIONS

Pressure pipelines shall be installed in open trenches, except when another method, such as jacking, boring, or tunneling, is shown on the Plans, specified, or ordered. Jetting shall not be allowed under roadway, alley, or driveway.

Pipe and fittings shall not be strung in residential areas more than 3 weeks in advance of pipelaying, unless otherwise approved by the Engineer. The Contractor shall install pipelines, pressure test, disinfect, and restore the ground surface in pipeline segments of 3,500 linear feet or less, except as otherwise approved by the Engineer. The new segment of pipelaying shall not start until restoration has commenced on the previous segment, or as approved by the Engineer.

Pipeline segments shall be pressure tested and disinfected after pipelaying is complete, to minimize inconvenience to the Public, except as otherwise approved by the Engineer.

No excavation shall be left open over a weekend. All pavement openings shall be completely repaired as specified in the Technical Specifications section headed "Surface Restoration" within 7 days of opening, or a temporary asphaltic pavement patch placed and maintained daily.

Where shown on the Plans or where directed by the Engineer, the Contractor shall remove existing pipelines which are shown to be abandoned. Any such pipe, fitting, etc., shall be removed after the new pipeline (replacing the existing line) is accepted and put into service by the City. Removed pipe and appurtenances 6 inches or larger which are described elsewhere or deemed by the Engineer to be reusable shall be delivered to the City Utilities Complex Yard by the Contractor. All material not deemed reusable shall become the Contractor's property and shall be removed from the site by the Contractor. No additional payment will be made for salvaging pipe and fittings.

Short tunneling of pressure pipe shall be constructed as required to protect trees, shrubs, and existing surface or subsurface utilities and structures. Short tunnels shall be constructed to the lengths shown on the Plans, specified, or directed by the Engineer.

Existing fences shall be restored by the Contractor and shall be finished and installed so that the restoration is equal to or better than the original. Only those portions of original fencing or materials there from, that the Engineer approves for re-use, shall be used by the Contractor in fence restoration. All other materials, including lumber, paint, wood preservative, concrete, and metal products shall be furnished by the Contractor.

The cost of protecting, replacing, relocating, and maintaining (including using hay bales) storm and sanitary sewerage facilities shall be included in the various unit price Pay Items, and no separate payment will be made therefore unless otherwise specified in other Pay Items.

12.06 LAYING AND JOINTING PRESSURE PIPELINES

All pressure pipeline installation shall comply with applicable standards of ANSI/AWWA C600, C605, and C906, and with these Specifications.

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Mechanical joint fittings and valves installed in sections of unrestrained pipe, and in blow-offs, shall be installed using ductile iron retainer glands, as set forth in the Technical Specifications section headed "Piping Materials: Ductile Iron Pipe."

PVC push-on fittings for pressure pipelines shall conform to the Technical Specifications section headed "Piping Materials: PVC Pressure Pipe."

Laying and jointing of HDPE pressure pipe shall conform to the Technical Specifications section headed "Piping Materials: Miscellaneous."

Excavation and backfill shall conform to the Technical Specifications section headed "Excavation and Backfill."

In lieu of jacking and boring or pushing of pipe up to 4-inch in diameter, the Contractor may use a softbore directional drilling process as provided by Flow Mole Corporation or approved equal.

Cover for all pressure pipeline Work, if not shown on the Plans, shall be not less than:

	2-inch and 4-inch	6-inch and larger
Under roadways and alleys:	36 inches	36 inches
Under grass and sidewalks:	24 inches	30 inches

Unless otherwise noted on the Plans or in other sections of this Specification, the pressure pipeline shall be handled and installed in strict accordance with the manufacturer's instructions and with the applicable AWWA Standards. If a conflict exists between the manufacturer's instructions and the AWWA Standards, the manufacturer's instructions shall govern.

Any defective material shall be removed from the job site immediately. Should a defect be discovered after the item has been placed in the trench, the replacement will be at the Contractor's expense. Materials shall be stored along installation routes in a manner acceptable to the Engineer or as described elsewhere in the Specifications.

Polyethylene wrapping shall be installed on ductile iron pipe and appurtenances where shown on the Plans or where ordered by the Engineer.

Polyethylene encasement materials and installation shall meet the applicable requirements of ANSI/AWWA C105. Care shall be taken while backfilling to prevent puncturing, tearing, or otherwise damaging the polyethylene wrapping.

The Contractor shall use every precaution during construction to protect the pressure pipeline against the entry of non-potable water, dirt, wood, small animals, and any other foreign material that would hinder or contaminate the operation of the pipeline. Where the groundwater elevation is above the bottom of the trench, the Contractor shall provide suitable dewatering equipment.

All dewatering shall meet the requirements set forth in the Technical Specifications section headed "Excavation and Backfill."

Watertight plugs of an approved type shall be installed in the ends of all pipe, fittings, and valves during 24-hour or longer periods when installation is not in progress, or as required to prevent ditch water, sand, etc. from entering the pipe.

Concrete thrust blocks of the proper size and type shall be furnished and installed at all locations where a change in the pipe alignment exceeds 7 degrees or dead ends, unless Plans show that

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adjacent pipe, in excess of 2 bells each direction, shall be restrained. Concrete thrust blocks used on 12-inch and larger mains shall be poured in place. Precast thrust blocks may be used on mains less than 12-inch in diameter. Thrust block concrete shall conform to the Technical Specifications section headed "Concrete, Masonry, and Reinforcing Steel."

Boring, soft boring, and jacking work other than new services shall strictly conform to all applicable stipulations of the State of Florida Department of Transportation Utility Accommodation Manual, unless otherwise specified. Softbore shall utilize a guided boring system, equal to FlowMole or DirectLine.

A. Expose Existing Pressure Pipeline and Record Elevation

The Contractor shall expose the existing pressure pipelines prior to the construction stake-out to determine the station, offset, and elevation, before actual construction begins. The Plans may be modified by the Engineer, as necessary, to accommodate the pressure pipelines which must remain.

B. Conflict Adjustment of Existing Pressure Pipelines

In some locations existing pressure pipelines intended to remain in service may need to be adjusted horizontally or vertically to avoid conflicts with the proposed storm drains, sanitary sewers, roadway base, manholes, inlets, or other proposed improvements. The conflict may not be shown on the Plans.

In the event that a conflict is encountered and confirmed by the Engineer, the adjustment to alleviate the conflict shall be constructed in accordance with the applicable "Obstruction Detail" or as ordered by the Engineer.

C. Pipe Joints

1. **Standard Mechanical Joints:** In making mechanical joints, the pipe shall be centered in the bells. The surfaces of ductile iron pipe with which the rubber gasket comes in contact shall be thoroughly brushed with a wire brush just prior to assembly of the joint. The surfaces of PVC pipe shall be wiped clean with a cloth and soapy water. A pipe lubricant shall be brushed over the gasket just prior to installation. The gasket and gland shall be placed in position, the bolts inserted, and the nuts tightened finger tight. The nuts shall be tightened by means of a torque wrench, or as approved by the City, in such a manner that the gland shall be brought up evenly into the joint. The following range of bolt torques shall be applied:

Bolt Size (inch dia.)	Range of Torque (foot lbs.)
5/8	45 - 60
3/4	75 - 90
1	70 - 100

If effective sealing is not obtained at a maximum torque listed above, the joint shall be disassembled and reassembled after thorough cleaning.

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2. **DI Pipe Push-On Joints:** In making up the push-on rubber gasket joint, the gasket seat in the socket shall be thoroughly brushed with a wire brush and the gasket shall be wiped with a clean cloth. The gasket shall be placed in the socket with the large round end entering first so that the groove fits over the bend in the seat. A thin film of approved lubricant shall then be applied to the inside surface of the gasket that will come in contact with the entering pipe. The plain end of the pipe to be entered shall be thoroughly brushed with a wire brush and placed in alignment with the bell of the pipe to which it is to be joined. Ends of cut pipe shall be ground to a smooth bevel edge before inserting in bell. The joint shall be made up by exerting sufficient force on the entering pipe so that its plain end is moved past the gasket until it makes contact with the base of the socket.

Backhoe buckets or excavation equipment are not to be applied directly to the pipe.

3. **PVC Pipe Push-On Joints:** Procedures for the making of PVC pipe push-on joints shall be similar in nature to those set forth in the preceding paragraph (except the bell shall be wiped with a clean cloth). Procedures shall strictly follow the manufacturer's printed instruction for the making of joints. In a like manner, all other PVC pipeline Work shall be performed in accordance with the manufacturer's recommendations.
4. **Restrained Joints:** Ductile iron mechanical joint pipe, fittings, and valves 12-inch and smaller that require restraint shall be installed using ductile iron retainer glands, as specified. The glands shall be installed in accordance with the manufacturer's recommendations. Glands using a frangible bolt for setting the restraining devices shall be tightened with standard wrenches.

Glands using standard bolts for setting the restraining devices shall be tightened with a torque wrench. The assembly shall be given 2 heavy coats of a bituminous coating after installation.

Restrained push-on joint pipe, fittings, and valves, where shown on the Plans, shall be with a restraining gland or restraining gasket, as specified.

At locations where the restraining gasket type joint is used, the words "RESTRAINED JOINT" shall be painted near the top of the bell of each such joint, in brick red 1-inch letters.

Pipe, fittings, and valve joints shall be restrained at locations shown on the Plans, or as specified. In addition, all other fittings and valves shall be installed using a ductile iron retainer gland.

The following shall apply to various restrained joint/pipe size type:

Pipe Size (Inches)	Restrained Joint Type
2	No restrained joint allowed.
4 through 12	Mechanical joint/retainer glands Tyton Pipe/Loc Fast Gasket, or equal
16 and larger	Mechanical joint/retainer glands

TR Flex, or equal, pipe valves and fittings

D. Color Coding

Prior to backfilling, all pressure pipelines shall be identified with color coding. The applicable color codes, with light color stabilant, are:

Pipe Use	Color Coding
Potable Water	Safety Blue
Sanitary Sewer	Safety Green
Reclaimed Water	Safety Purple

1. **Coding on the Pipe:** HDPE and PVC pipe shall be colored at the point of manufacture. If black or white pipe must be used, pipe shall have City approved color coded ink lettering stamped on the pipe, or shall be continuously taped with plastic adhesive tape using the color coding as stated above. Plastic adhesive tape shall be applied as follows:

Black and white 2-inch and 4-inch pipe -- continuously taped at top center.

Black and white 6-inch and larger pipe -- continuously taped at "10, 12, and 2 o'clock."

Ductile iron pipe shall be continuously painted along the top one-third of the pipe with a 2-part high build epoxy-polyamide paint or approved equal. The paint shall be dry prior to the pipe being installed.

Ductile iron pipe wrapped in color coded polyethylene wrapping is not required to be painted.

2. **Coding above the Pipe:** HDPE and PVC pipe shall also be color coded by installation of a metal tape, equal to Teratape, laid continuously 1 foot above all pipe. Tape shall be cut in 5-foot lengths and installed with no gaps, to facilitate future field location and pipe protection. Color coded tape shall be labeled "Water Main," "Reclaimed Water Main," or "Sanitary Force Main," as required.

Ductile iron pipe shall not require coded tape above the pipe, nor shall HDPE or PVC pipe installed by directional boring.

E. Valves and Valve Boxes

Valves shall be installed in a closed position, free from all distortion and strain, and left in satisfactory operating condition. Valves shall be tested in place by the Contractor, as far as practicable, and any defects in valves or connections shall be corrected to the satisfaction of the Engineer.

Tapping sleeves shall be pressure tested prior to making the tap.

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Valve boxes with stay-put cover shall be vertical and concentric with the valve stem. Any valve box which is moved from its original position, preventing the operation of the valve stem, shall be satisfactorily reset by the Contractor at his expense.

F. Service Connections

The Contractor shall bore new services from new pressure pipelines under existing roads which are not to be reconstructed. The method of boring shall be by boring or pushing, or by a method approved by the Engineer. Water jetting and open cutting of pavement shall not be permitted.

After a new water main has been tested, disinfected, approved by the City, and placed in service, the Contractor shall furnish the required labor and equipment to transfer existing meters to the new house service. All materials required for these connections or service transfers shall be supplied by the Contractor.

The closing of any existing valve necessary for this work will be performed by City personnel only.

Replacements for meter boxes broken prior to construction may be supplied by the City (upon approval by the Inspector) to be installed by the Contractor. Abandoned house service lines shall be removed, unless otherwise ordered by the Engineer. Any meter boxes damaged by the Contractor shall be replaced and installed by the Contractor at his expense.

Water meters of various sizes may be required to be relocated and/or reconnected. The cost of relocation/reconnection shall be included in the appropriate Pay Item. Where existing pipelines are to be abandoned, new service lines shall be installed to connect to existing meters, as ordered by the Engineer.

G. Connections (Tie-ins) and Shutdowns

The Contractor shall furnish all labor and equipment necessary for the connection of approved pipelines to the existing system and the shutdown, removal or disconnection and plugging of existing pipelines as indicated on the Plans or as directed by the Engineer.

This may be required in instances where existing pipelines are to be abandoned or where a short segment of existing pipeline must be cut out and adjusted either vertically or horizontally to avoid a conflict with a proposed storm drain or storm drain structure, sanitary sewer, or other proposed improvement.

The Contractor shall make all taps and tie-ins required, under the direct observation of the Engineer.

12.07 TESTING AND DISINFECTION OF PRESSURE PIPELINES

All new pressure pipelines shall be subjected to a water pressure test between valves. In order to expedite the restoration of certain surface facilities, it may be required that individual sections between valves be tested as soon as the valves are installed. Disinfection shall be accomplished after the pressure test requirements have been met for the entire segment of pressure pipe.

The Contractor shall furnish all labor, materials, equipment, and chemicals to perform the required pressure tests and disinfection. All testing and disinfection will be subject to City inspection. All new valves shall be operated by the Contractor. However, all tie-in valves to the existing water system

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shall only be operated with the approval of, and in the presence of, the City Sanitarian, and shall be scheduled to be performed during the standard work hours of the City Sanitarian, unless otherwise approved by the Engineer.

All existing valves shall be operated by the City Sanitarian or by the Contractor under the direct supervision of the City Sanitarian.

A. Blow-off Assemblies

Pressure pipelines shall be flushed through a blow-off assembly at those locations as shown on the Plans or as ordered by the Engineer.

Potable and reclaimed water pipelines 2-inch through 12-inch shall have a permanent or temporary blow-off assembly at those locations as shown on the Plans or as ordered by the Engineer.

B. Pressure Test

All lines shall be subjected to a water pressure test as follows:

Water pipelines 2-inch through 12-inch	100 psi
Water pipelines 14-inch and larger	150 psi
Sewer force mains - all sizes	100 psi

Temporary plugs or caps shall be furnished by the Contractor for this purpose, and the Contractor shall furnish personnel and all other necessary equipment required to accomplish the test. The pipeline or force main shall be entirely free of air when subjected to the pressure test.

The test pressure shall be applied to the piping through a corporation tap in the main by means of a pump or other approved method and maintained for a minimum of 2 hours. Water for testing will be furnished from existing pressure pipelines of the City of St. Petersburg, through a tap or taps provided at the Contractor's expense in accordance with City policies. Air shall not be used for testing. Potable water shall be used for testing potable water pipelines. Reclaimed water shall be used for testing reclaimed water pipelines. Potable water shall be used for testing sanitary force mains when reclaimed water is not available.

The allowable leakage is tabulated as follows, as the allowable leakage for pressure pipelines permitted by Section 5 of ANSI/AWWA C600 for ductile iron and Section 7 of ANSI/AWWA C605 for PVC:

**Allowable Leakage per 1,000 Feet of Pipeline
(gallons per hour)**

Test Pressure	Nominal Pipe Diameter (inches)													
	2	4	6	8	10	12	14	16	18	20	24	30	36	
100 psi	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	1.5	1.8	2.3	2.7	
150 psi	0.3	0.4	0.6	0.7	0.9	1.1	1.3	1.5	1.7	1.8	2.2	2.8	3.3	

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Valves in the section being tested shall be operated through several complete cycles of closing and opening. In addition, each valve shall be closed and the test pressure applied to one end of the valve only. Each end of the valve shall be tested in this manner. There shall be no visible leakage through the valve, and the valve shall not show any evidence of movement or structural distress.

All restrained pipe sections and thrust blocks shall be completely backfilled before testing.

All tests shall be under the observation of the Engineer. All tests and inspections shall be conducted in a manner to minimize as much as possible any interference with the Contractor's work or progress. All tests shall be made with water at the pressures specified herein.

The Contractor shall notify the City Inspector 48 hours in advance of when the work is ready for testing and inspection. Tests and inspection shall be made as soon thereafter as practicable.

C. Disinfection

Immediately after a potable or reclaimed water pipeline segment has been pressure tested and accepted by the Engineer, it shall be disinfected by the Contractor under the supervision of the Engineer. Raw sewage pressure pipelines shall not be disinfected. The Contractor shall furnish all necessary labor, equipment, and chemicals to perform the disinfection in full accordance with requirements of the State of Florida Department of Environmental Protection, the Pinellas County Health Department, and the City.

The City will not approve disinfection by using chlorine gas as a method.

The Contractor shall install all sampling taps and appurtenances at 500 to 600 foot intervals as shown on the Plans or as ordered by the Engineer. Corporation stops shall be used for this purpose. Corporation stops shall be left closed in place. All other materials furnished by the Contractor for the disinfection test shall be removed by the Contractor, as ordered by the Engineer.

The type of chlorine and the procedure for disinfection shall be in accordance with the ANSI/AWWA C651. The Contractor shall flush all pipelines and appurtenances with clean water after disinfection. Flushing water shall not be permitted to discharge into existing pressure pipelines. Water required for disinfection and flushing shall be furnished by the City, from existing mains. Modifications in materials used or in procedure may be made with the written approval of the Engineer.

Potable water pipelines, reclaimed water pipelines, and pressurizing equipment shall first be pressure tested and flushed with clean water. Chlorine solution shall then be added at one end of the section being disinfected and discharged at the far end. Chlorine solution shall be added until the water coming from the far end has a chlorine residual of not less than 10 mg/l. The pipeline segment shall then be closed and the solution shall be allowed to remain in the lines for a minimum of 24 hours. The pipeline and pressurizing equipment shall then be thoroughly flushed out and filled with clean water.

Water samples will be collected from potable water pipelines by the City Sanitarian and delivered to the Pinellas County Health Department for bacteriological testing. The City may test samples taken from reclaimed water pipelines. If tests of samples are not satisfactory, the entire disinfection procedure shall be repeated at the expense of the Contractor.

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The connections to the existing water main shall then be made after disinfection of the new pipeline is successfully completed and accepted. The materials used to make the connections shall be cleaned and sprayed or mopped with a solution containing not less than 50 mg/l of available chlorine prior to installation.

The Contractor shall prevent any ditch water or other contaminants from entering the new or existing pipe.

12.08 SURFACE RESTORATION AND MISCELLANEOUS

- A. All surfaces disturbed by the Contractor shall be restored to their original condition in conformance to City Standards and as specified under the Technical Specifications sections headed "Surface Restoration" and "Miscellaneous Work."
- B. Sanitary sewers and laterals which cross a new potable water pipeline with less than 18 inches clear vertical separation, shall be replaced with 20 linear feet of ductile iron pipe, PVC pressure pipe (ANSI/AWWA C900 or C905 depending on pipe size), or SDR26 gravity pipe centered on the new pipeline, or as ordered by the Engineer.

Sanitary sewers and/or laterals which conflict with the new pipeline or are damaged by pipeline construction shall be reconstructed with ductile iron pipe, PVC pressure pipe (ANSI/AWWA C900 or C905), or SDR26 gravity pipe, as ordered by the Engineer.

- C. Each valve box in an unpaved area shall have an 18-inch by 18-inch by 4-inch concrete pad. Pad shall be 1 inch above grade, and sod shall be so placed to maintain this 1 inch.

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SECTION 13 - SURFACE RESTORATION

13.01 GENERAL

The Work in this section includes restoring and maintaining pavements and pavement bases, curbing, sidewalks, driveways, and grass surfaces that are disturbed, damaged, or destroyed during the course of the Work under this Contract.

The quality of workmanship and materials used in the restoration shall produce a surface equal to or better than the condition before the Work began.

Prior to restoration, the Contractor shall saw cut and remove all existing pavement within 2 feet of the edge of the excavation, or within such widths as may be ordered by the Engineer.

Compaction of soil and base materials shall be tested using the AASHTO T 180 method.

Surface restoration workmanship and materials shall conform to the applicable sections of the DOT-SSRBC.

All dirt areas disturbed shall be restored with sod, unless otherwise specified.

The City reserves the right to delete any or all of the restoration work.

13.02 ROADWAY RESTORATION

Where the installation of pipe or structures occurs within an existing roadway, the limits of excavation shall be saw cut leaving a straight and square edge. The upper portion of the trench backfill shall be replaced with a compacted shell, crushed (reclaimed) concrete, or limerock base as shown on the Plans, and paved to match the surrounding surface. Replacement base material shall be the same as the existing base. Roadway restoration shall conform to the detail for "Flexible Pavement Restoration."

13.03 TEMPORARY PAVEMENT

Immediately upon completion of backfilling, the pavement surfaces damaged or destroyed shall be temporarily restored by placing a shell (DOT-SSRBC Section 913), crushed (reclaimed) concrete (DOT-SSRBC Section 204 applicable sections), or limerock (DOT-SSRBC Section 911) base on the backfilled, compacted subgrade, and an adequate temporary asphaltic patch as shown or as approved by the Engineer. Shell, crushed (reclaimed) concrete, or limerock shall be used as a base for all bituminous pavements.

Temporary work shall be maintained in a suitable and safe condition for traffic until the permanent pavement is laid or until final acceptance of the Work.

13.04 SHELL BASE

Shell base shall be constructed on the prepared subgrade to not less than 98 percent of maximum density, in accordance with the requirements of DOT-SSRBC Section 250. The minimum compacted thickness of shell base shall conform to the detail for "Flexible Pavement Restoration."

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13.05 LIMEROCK BASE

Limerock base shall be constructed on the prepared subgrade to not less than 98 percent of maximum density, in accordance with the requirements of DOT-SSRBC Section 200. The minimum compacted thickness of limerock base shall conform to the detail for "Flexible Pavement Restoration."

13.06 CRUSHED (RECLAIMED) CONCRETE BASE

Crushed (reclaimed) concrete base shall be constructed on the prepared subgrade to not less than 98 percent of maximum density, in accordance with the requirements of DOT-SSRBC Section 204. The minimum compacted thickness of crushed (reclaimed) concrete base shall conform to the detail for "Flexible Pavement Restoration."

The minimum limerock bearing ratio (LBR) value shall be 150.

13.07 ASPHALTIC CONCRETE PAVEMENT

A prime coat shall be applied to the prepared base in accordance with DOT-SSRBC Section 300 prior to permanent asphaltic concrete pavement.

Unless specified elsewhere, all permanent asphaltic concrete pavement replacement shall be Type SP-1 and shall be constructed in accordance with the requirements of DOT-SSRBC Sections 320, 330, and 331. Compacted thickness shall conform to the detail for "Flexible Pavement Restoration."

13.08 BRICK PAVEMENT

Construction of brick pavement shall follow the details as shown on the Plans and City standard practice using City standard paving brick or red clay brick conforming to ASTM C 32, Grade SS with City standard dimensions.

Streets with exposed brick surface shall be restored with brick. Brick pavers removed from streets that are not to be restored with brick shall remain the property of the City of St. Petersburg. Bricks not required for restoration, even those that have been overlaid with asphalt, shall be delivered by the Contractor to the City of St. Petersburg Maintenance Storage Yard, 3rd Avenue North and 17th Street. Brick streets that are restored shall be restored to a condition of a new well-defined and contoured cross section with a surface appearance equal to or better than that which previously existed.

Bricks which are broken or damaged by the Contractor shall not be reused. Replacement bricks shall be purchased from the Maintenance Storage Yard. The Contractor shall obtain the current brick charge from the Stormwater, Pavement and Traffic Operations Department, Pavement Maintenance, phone 893-7260.

Brick street abutting asphalt pavement shall have a minimum 6-inch-wide flush Type A Header Curb.

13.09 CURB AND GUTTER

All permanent restoration of street curb, or curb and gutter, shall be of the same type and thickness as the curb, or curb and gutter, which abuts. The grade of the restored curb, or curb and gutter, shall conform to the grade of the existing adjacent curb, or curb and gutter, so that positive drainage is maintained.

13.10 CONCRETE SIDEWALK

The restoration and construction of concrete sidewalks shall conform to applicable requirements of DOT-SSRBC Section 522 and the Plans, and shall be constructed where shown on the Plans and directed by the City. Sidewalk expansion joints with bituminous filler shall be installed at a maximum of 50-foot intervals on center, and struck joints shall be spaced equidistant with walk width (joints wider than 6 feet shall be spaced as directed by the City). Where new construction is to be tied into existing facilities, the old material is to be removed back to the nearest construction joint, or sawcut to a straight line as directed by the Engineer. The soil under sidewalks and driveways shall be compacted to 98 percent of the maximum density.

New sidewalks shall be 4 inches thick. Concrete pour for walk construction shall be made only on dampened subgrade. A soft broom finish shall be given the walk surface as directed by the Engineer.

Sidewalks crossing driveways shall be constructed according to the Specifications for concrete driveways.

Curb ramps for physically handicapped shall be constructed at all locations where sidewalks cross the curb or where directed by the Engineer. Those existing sidewalks which are removed to accomplish associated work as a part of this Project shall be replaced with a curb ramp when the sidewalk crosses the curb. The cost of curb ramps shall be included in the appropriate proposal item for sidewalk restoration.

Where sidewalks are replaced, the replacement shall be the full width of the walk and the minimum length shall be 60 inches. Restoration of adjacent lawn is incidental to sidewalk replacement and no separate payment will be made therefore.

13.11 HEXAGON BLOCK SIDEWALK

The restoration and construction of hexagon block sidewalks shall conform to the details shown on the Plans and City standard practice using City standard hexagon blocks.

The soil under sidewalks and driveways shall be compacted to 98 percent of the maximum density. New hexagon block sidewalks shall be 2 inches thick.

Curb ramps for physically handicapped shall be constructed at all locations where sidewalks cross the curb, or where directed by the Engineer. Those existing sidewalks which are removed to accomplish associated work as a part of this Project shall be replaced with a curb ramp when the sidewalk crosses the curb. The cost of curb ramps shall be included in the appropriate Pay Item for sidewalk restoration.

Where sidewalks are replaced, the replacement shall be the full width of the walk. Restoration of adjacent grass is incidental to sidewalk replacement and no separate payment will be made therefore.

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Hexagon block removed from a sidewalk that is not to be restored with hexagon block shall remain the property of the City of St. Petersburg. Hexagon block not required for restoration shall be delivered by the Contractor to the City of St. Petersburg Maintenance Storage Yard, 3rd Avenue North and 17th Street. Hexagon block that is broken or damaged by the Contractor shall not be reused. Replacement hexagon block may be purchased from the Maintenance Storage Yard. The Contractor shall obtain the current hexagon block charge from the Stormwater, Pavement and Traffic Operations Department, Pavement Maintenance, phone 893-7260.

13.12 DRIVEWAY AND PARKING LOT

Except as otherwise specified, all permanent restoration of base and surface of driveways, parking aprons, and sidewalks shall match the materials, thicknesses, elevations, lines, and grades of the existing construction, all to the Engineer's satisfaction. Patching of Portland cement driveway areas will not be allowed between joints or dummy joints.

For areas where streets are to be paved, or where more than 50 percent of the driveway apron is disturbed, concrete or brick driveways shall be replaced in kind. All other driveways, including shell and dirt, shall be restored with an asphalt concrete surface from the street to the property line or front of sidewalk, as directed by the Engineer.

All base compaction under driveways shall be to a minimum density of 98 percent of the maximum density.

13.13 DRIVEWAY - ASPHALT

Residential asphalt driveway restoration shall include 1-inch thick asphaltic concrete surface over 2 inches of compacted sand-asphalt hot mix base, or 5 inches of compacted limerock or shell base.

Commercial asphalt driveway restoration shall be constructed of 1-inch thick asphaltic concrete surface over 8 inches of limerock base compacted in 2 lifts.

13.14 DRIVEWAY - CONCRETE

The restoration and construction of concrete driveways shall conform to applicable requirements of DOT-SSRBC Section 522 and the Plans, and shall be constructed where shown on the Plans and directed by the Engineer.

Residential concrete driveway restoration shall be 5 inches thick and shall include placing a single layer of 6-inch by 6-inch wire mesh (WWF 6 x 6 - W1.4 x W1.4).

Commercial concrete driveways shall be 6 inches thick with a double layer of 6-inch by 6-inch wire mesh (WWF 6 x 6 - W1.4 x W1.4).

13.15 DRIVEWAY - PEAGRAVEL

Where less than 50 percent of the driveway apron is disturbed, peagravel driveways shall be restored to match the existing driveway. Peagravel driveway restoration shall include asphalt treated shell base 5 inches thick after compaction to a minimum density of 98 percent of the maximum.

13.16 DRIVEWAY - SHELL

Where less than 50 percent of the driveway apron is disturbed, shell driveways shall be restored to match the existing driveway. Shell driveway restoration shall be 5 inches thick after compaction to a minimum density of 98 percent.

13.17 GRASS

A. Seeding

Seed shall be sown as soon as practical after paving, pipeline, or other work has been completed.

Seeding where shown or ordered shall be accomplished in a manner satisfactory to the Engineer. All work and materials shall meet the applicable requirements DOT-SSRBC, Sections 570, 981, and 982. Prior to seeding, fertilizer shall be applied at a rate as recommended by the manufacturer.

The type grass seed to be sown shall be of the same variety as the grass removed or as is predominately adjacent, as approved by the Engineer. Seed sown in cooler months, which will not germinate until spring, shall be over seeded with Rye grass seed or other approved winter variety.

B. Sodding Within Street Rights-of-Way

Sod shall be planted as soon as practical after paving, pipeline, or other work has been completed.

All work and materials shall meet the applicable requirements DOT-SSRBC Section 575 (Sodding).

Sodding shall be done as directed by the Engineer, using only material which, in the opinion of the Engineer, is healthy and free of weeds, and (unless specified otherwise by the Engineer) of the same variety predominating at time of removal. Sod may be St. Augustine, Bahia, or other varieties as selected by the Engineer.

Sod shall be planted within 72 hours of being cut. Only moist, green sod having a virile root system may be planted. Sod shall be cut into adjacent sod to provide a smooth surface, and "top dressed" where necessary. Sod shall be rolled or tamped after planting to provide a uniform and consistent grade.

C. Grass Maintenance

The Contractor shall properly water and otherwise maintain all seeded and sodded areas for a minimum of 60 consecutive calendar days after completion of seeding or sodding operations. After the 60 days, and upon receipt of written request from the Contractor, the Engineer will inspect the areas for acceptance by the City. Any area that is washed or eroded, fails to show a uniform stand of healthy, vigorous grassing, or does not appear to be otherwise developing satisfactorily, shall be reseeded or re-sodded and maintained until suitable for acceptance by the Engineer.

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In the event that the stand of grass is found to be contaminated by weeds or other undesirable growth, the Contractor will be required to effectively eliminate such undesirable growth at his own expense.

13.18 EXPANSION JOINT MATERIAL

Expansion joint material for concrete pavement surfaces, including sidewalks and driveways, shall be the bituminous strip type, 1/2-inch thick, and shall conform to applicable requirements of DOT-SSRBC Section 932.

SECTION 14 - MISCELLANEOUS WORK

14.01 GENERAL

The Work in this section includes miscellaneous items that have not been included in other Technical Specifications sections or on the Plans. Work includes riprap, replacement of existing sanitary sewer pipes in close proximity to water mains or other construction, concrete encasement of pipes or conduits, guardrail, handrail, fence, and groundwater contamination containment.

14.02 RIPRAP

Riprap shall be placed as directed by the Engineer at locations indicated on the Plans. Materials, construction method, and method of measurement shall conform to requirements of DOT-SSRBC Section 530, except for the following requirements.

Riprap shall contain no deleterious silts, organics, biodegradables, or solvable materials, and shall contain no reinforcing steel or any other metals. No riprap shall be placed over or within a seagrass bed community. Turbidity curtains or similar devices, where required, shall be utilized to prevent violation of state water quality standards (see Technical Specifications "SECTION 1 - GENERAL" article entitled "Prevention, Control, and Abatement of Erosion and Water Pollution").

For sand-cement riprap, scrim reinforced paper sacks are not acceptable.

Rubble riprap shall have a minimum dimension of 6 inches in any direction and a maximum 3:1 ratio of material length-to-width. Each piece of rubble riprap shall weigh a minimum of 50 pounds. Rubble riprap shall be placed on an acceptable filter fabric liner, and on no slope greater than 2 feet horizontal to 1 foot vertical. If the toe of slope is below the mean high water line of an open body of water, the filter fabric liner shall extend waterward a minimum of 3 feet or as directed by the Engineer.

14.03 SANITARY SEWER REPLACEMENT

Existing sanitary sewers shall be replaced with appropriate diameter PVC pressure pipe at locations and for lengths indicated on the Plans. All such replacements of 18 linear feet or less shall be made with a single length of pipe. All connections of existing pipe to replacement pipe shall be by Flex-Seal Adjustable Repair Coupling Series MR-ARC with Series 316 stainless steel shear rings as manufactured by Mission Rubber Company or approved equal.

PVC pressure pipe shall conform to ANSI/AWWA C900, DR18, for sizes up to 12-inch in diameter, or ANSI/AWWA C905, DR25, for sizes 14-inch through 36-inch.

PVC pipe shall be manufactured of solid green color, or white with approved continuous green ink lettering.

PVC pipe replacement lengths shall include green metallic identification tape, in 5-foot lengths, placed 1 foot above the pipe.

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14.04 CONCRETE ENCASEMENT OF EXISTING UTILITIES

Existing sanitary sewers or other utilities shall be encased in Portland cement concrete, conforming to DOT-SSRBC Section 346 and Technical Specifications "SECTION 3 - CONCRETE, MASONRY AND REINFORCING STEEL," 2,500 psi, at locations and to dimensions indicated on the Plans, or as directed by the Engineer.

14.05 GUARDRAIL

Guardrail is to be placed in locations as specified in the Plans. The materials and method of construction shall be in accordance with DOT Index No. 400 and DOT-SSRBC Section 536.

14.06 CHAIN-LINK FENCE

Chain-link fence shall be DOT Type B and shall be placed at locations as specified in the Plans. The materials and method of construction shall be in accordance with DOT Index No. 452 and DOT-SSRBC Section 550. Cantilever slide gate construction shall be in accordance with DOT Index No. 453. The materials used for the fence and gate construction shall be galvanized steel option only. The chain-link fabric shall be dark green Type IV vinyl-coated fabric. All hardware components including posts, braces, and rods, shall be powder-coated to match the dark green vinyl-coated fabric.

14.07 ALUMINUM HANDRAIL

Aluminum handrail shall be placed in locations as shown on the Plans. The materials and method of construction shall be in accordance with DOT Index No. 860.

SECTION 15 - PRECAST CONCRETE BOX CULVERT CONSTRUCTION

15.01 GENERAL

The Work in this section includes furnishing all plant, labor, equipment, and materials, and performing all operations, in connection with the manufacture and installation of precast concrete box culverts, complete. Cast-in-place concrete culverts will not be accepted. Three-sided box culverts will not be accepted.

All drawings and calculations submitted for the Engineer's approval shall be signed and sealed by a Professional Engineer registered in the State of Florida.

Surface restoration shall conform to the requirements of the Technical Specifications section headed "Surface Restoration."

City specification requirements shall supersede the ASTM Standards.

The following Standards are referenced in this section:

AASHTO T 180	"Moisture-Density Relations of Soils Using a (4.5-kg) 10-lb Rammer and an (457-mm) 18-in. Drop"
ASTM C 877	"External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections"
ASTM C 990	"Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Concrete Box Sections Using Preformed Flexible Joint Sealants"
ASTM C 1433	"Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers"
DOT-SSRBC Section 346	"Portland Cement Concrete"
DOT-SSRBC Section 425	"Inlets, Manholes, and Junction Boxes"

15.02 DATA TO BE SUBMITTED

The Contractor shall submit shop drawings in accordance with the *General Conditions* article headed "Shop Drawings and Submittals" for: precast units for manhole, riser, and pipe connections (with sizes and locations of all openings); cast-in-place components; and any modification that may be required for the installation. Calculations demonstrating equivalent flow capacities shall be submitted for any proposed manufacturer's deviation from standard ASTM dimensions.

Calculations shall be submitted demonstrating structural adequacy for: a minimum HS-20 loading or other loading indicated on the Plans; the proposed cover height; and determining critical design soil conditions by comparing saturated and unsaturated conditions. The structural calculations shall include the required reinforcing steel for the conditions detailed on the shop drawings.

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A concrete mix design shall be submitted by the Contractor and approved by the Engineer before the manufacture of any box culvert segment or related component.

Internal joint sealing materials and external sealing band for joints shall be submitted.

The Contractor shall submit a laying schedule with all units marked and shown in proper relation to each other according to proposed sequence of installation.

15.03 FABRICATION

Concrete shall conform to or exceed the requirements of the Technical Specifications section headed "Concrete, Masonry, and Reinforcing Steel." All box culverts to be placed with a flow line elevation at or below elevation 103.00 (by City Datum) shall be constructed using a concrete mix with a minimum cementitious content of 658 pounds per cubic yard, in accordance with DOT-SSRBC Section 346, and with a water cement ratio not exceeding 0.41.

- A. Precast boxes shall conform to the requirements of ASTM C 1433, latest edition, except the minimum concrete cover over all steel reinforcement, including ends of longitudinal steel, shall be 2 inches and the required steel reinforcing bars shall be modified accordingly and so indicated in the calculations and shown on the shop drawings.
- B. Extra reinforcing shall be provided by the box culvert fabricator around the entire circumference of openings for all lateral connections and top manhole connections to the box culvert to support the design loads, to develop the full bond of the bars, and to maintain the integrity of the box culvert sections. All such extra reinforcing shall be designed by a Professional Engineer registered in the State of Florida, and signed and sealed.
- C. Openings for lateral connections shall be a minimum 4 inches greater in diameter than the outside diameter of the lateral pipe to permit installation of the lateral pipe. The annular opening between the pipe and box culvert wall shall be grouted the full thickness of the box culvert wall using non-shrink grout.
- D. When used with headwalls and other special features, special precast end sections having exposed reinforcement for tying headwall or manhole reinforcing steel shall be provided directly from the manufacturer (field cutting of the sections for the purpose of exposing reinforcement will not be permitted).
- E. Precast boxes shall be marked, by the manufacturer before shipping, in the order of laying sequence required by the laying schedule.
- F. All precast concrete box culverts shall be furnished by a manufacturer who has specialized in the production of precast concrete products for not less than 3 years, has successfully completed comparable projects, and whose company is on the most recent FDOT-approved list of manufacturers for box culverts.
- G. The Contractor shall verify size, horizontal locations, and vertical locations of all storm pipes, underdrains, conflict pipes, or any other item which requires an opening in the new box culvert, prior to ordering same from the precast manufacturer.

15.04 TRENCH, PLACEMENT, AND BACKFILLING

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Work shall conform to the Technical Specifications section headed "Excavation and Backfill."

- A. All precast box culvert sections shall be laid on a dry, unyielding foundation. Dewatering devices shall be capable of maintaining a trench bottom that is stable and surface-dry.
- B. The bedding shall consist of a minimum 12-inch depth of FDOT No. 57 course aggregate placed below the box culvert in 6-inch lifts and shall be uniformly compacted to 98 percent of the maximum density in accordance with AASHTO T-180 and extend a minimum of 1 foot outside the exterior walls of the culvert. When required by the Plans, other special bedding shall be provided.
- C. The placement of gravel (course aggregate) bedding shall include an impermeable groundwater barrier to be placed at 100-foot intervals in the gravel bedding. The barrier shall consist of a 10-mil sheet of polyethylene that covers the full cross sectional area of the gravel, touches the bottom of the culvert, and is embedded an additional 6 inches into the trench sides and bottom. The barrier shall be offset a minimum of 2 feet from any culvert joint. The polyethylene sheet shall be anchored in place by an approved method and shall be lapped a minimum of 12 inches at the end of rolls or at other splice points.
- D. The Contractor's method of controlling line and grade during culvert installation shall be subject to the approval of the Engineer. The method shall be capable of allowing rapid checking of the previously laid sections. The Contractor shall be responsible for maintaining line and grade on sections previously laid. Sections that do not retain, during the laying of subsequent sections, the horizontal or vertical alignment within 0.10 feet as shown on the Plans, shall be considered as not having been laid to line and grade. Sections not laid to line and grade shall be taken up and re-laid without additional compensation.
- E. Backfilling shall commence only after it is determined that the culvert sections have been laid to line and grade and will not be affected by subsequent laying procedures.
- F. Holes provided for lifting or joint restraint shall be filled and sealed by plugging with a non-shrink mortar, and shall be properly cured to ensure a sound and watertight plug.

15.05 JOINTS

- A. Field joints for precast concrete box culvert sections shall be rubber, plastic, or a preformed bituminous joint sealing material in accordance with ASTM C 990; equal to Ram-Nek as manufactured by Henry Company, or other approved watertight joint. Culverts to be laid with joints made from preformed bituminous gasket material shall be subject to the following requirements: the Contractor shall furnish to the Engineer a written recommendation of the size (cross-sectional area) of gasket material that will create a watertight seal; this amount shall be the minimum quantity of gasket material used. Any joint material protruding past the interior surface shall be struck off flush.
- B. The outside of each joint shall be completely sealed by the use of a minimum 13-inch-wide external sealing band in accordance with ASTM C 877 Type I; Cadilloc External Pipe Joint Band as manufactured by Upper Peninsula Rubber Company Inc., or approved equal. The sealing band shall be centered on the joint.
- C. The joint shall be secured in place by a method satisfactory to the Engineer to assure there will be no displacement or opening of the joint.

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- D. Headwalls and other special features shall be constructed in place. A sufficient length of steel reinforcing shall be left exposed for connection to endwalls or cast-in-place culvert sections.
- E. Manholes or manhole risers for entrance into box culverts shall be constructed over new or existing concrete box culverts at locations and to dimensions shown on the Plans. The top slab of the box culvert shall be used as the base of the manholes or manhole risers, and all other construction shall conform to the requirements for standard manholes as shown on the Plans and as described in the Technical Specifications section headed "Storm Drainage Construction."
- F. Junction boxes or manholes shall be constructed to the dimensions shown on the Plans, and shall conform to all applicable requirements of DOT-SSRBC Section 425, City Standard Details, and the Technical Specifications section headed "Storm Drainage Construction."

SECTION 16 - HORIZONTAL DIRECTIONAL DRILLING

16.01 GENERAL

The Work in this section includes construction of high density polyethylene (HDPE), polyvinyl chloride (PVC) restrained joint (RJ), pressure main using the horizontal directional drilling (HDD) method. The Contractor may install short transition reaches, as required and approved, by open cut procedures, in accordance with the applicable Technical Specifications.

The contractor performing the HDD Work shall have a minimum of 4 years experience with similar directional drilling construction. The contractor's operations shall be in conformance with the Directional Crossing Contractors Association's (DCCA) published guidelines (latest edition) and pipe manufacturer's guidelines and recommendations.

16.02 DATA TO BE SUBMITTED

The Contractor shall submit shop drawings in accordance with the *General Conditions* Article headed "Shop Drawings and Submittals." The following shall be submitted before mobilization to the Project site:

- A. Calculations of pipe tensile stresses and equipment loads expected during installation of the longest reaches proposed. Calculations shall include pipe outside diameter, reamer outside diameter, drilling head description, and wash over pipe description if applicable.
- B. HDPE pipe stress regression testing certification from pipe manufacturer.
- C. Proposed Project Plan clearly indicating where each installation method (HDD and open cut trench) will be employed, as well as the location of boring pits and equipment setups.
- D. Drill rig make, model, condition, and capacity.
- E. Heat fusion equipment operators' certifications and certificates of training and fusion proficiency for joining HDPE pipe.
- F. Layout location with approximate space requirements, of proposed equipment and materials including the following: trucks, rig unit, power unit, drill pipe, and water pump; slurry tanks, pumps, and pits; bentonite storage; and entry and exit pits.

16.03 EQUIPMENT AND MATERIALS

- A. The equipment used in the HDD operation shall be fluid-assisted with mechanical cutting head. The equipment shall have the built-in capacity, stability, and necessary safety features required to fully comply with these Specifications. Equipment shall be set up and used according to manufacturer's recommendation.

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- B. HDPE pipe sections shall be jointed by heat fusion. The heat fusion unit shall be equipped with facing and clamping devices, and with automated heating plates with provisions for the sliding/bonding operation. The heat fusion equipment used in all the joining procedures shall be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature, alignment, and interfacial fusion pressure. The tensile strength of the heat fused joint shall be equal or greater than the tensile strength of the HDPE pipe.
- C. On each day "butt fusions" are to be made, the first fusion of the day shall be a trial fusion. The trial fusion shall be allowed to cool completely, then fusion test straps shall be cut out. The test strap shall be 12 inches or 30 times the wall thickness in length (minimum) and 1 inch or 1.5 times the wall thickness in width (minimum). The test strap shall be bent until the ends of the strap touch. If the fusion fails at the joint, a new trial fusion shall be made, cooled completely, and tested. Butt fusion of pipe to be installed shall not commence until a trial fusion has passed the bent strap test.
- D. The Contractor shall utilize either a walkover system or a wire line steering tool system, as specified, to track and steer the boring tool to avoid existing utilities in its path and maintain the alignment of the pilot hole.
1. **Walkover system:** shall consist of a transmitter or sonde that is placed in a housing located behind the drill bit and an electronic receiver held by the locator.
 2. **Wire line steering tool system:** shall provide wire line locating runs in conjunction with a steering tool placed in a non-magnetic bottom hole assembly wired to a surface computer that gives magnetic readouts.
- E. A log shall be kept by the driller showing the number of drill rods inserted in the boring. The number of drill rods inserted shall be converted to a horizontal distance between the drill rig and the drill bit. This horizontal distance shall be continuously coordinated with the horizontal distance readout shown by electronic means on the drill rig (and wire line computer if used) as each rod is added to or removed from the shaft. If the drill bit becomes "lost," meaning its location cannot be determined and its elevation or distance to the drill rig is unknown, the entire drilling assembly shall be removed from the shaft and the boring restarted.
- F. The installation shall utilize a mixture of bentonite clay, water, and if required, a small amount of polymer. The mixture shall be emitted through small diameter jets to work its way through the soil, stabilize the tunnel wall, and lubricate the pipe being installed. The make-up water shall have a pH of greater than 6 (8 to 9 is desirable) to allow the bentonite clay to yield to its fullest potential. A viscosity of 38 to 40 seconds per quart is optimal and shall be targeted as required to provide a drilling fluid which will both establish the integrity of the pilot hole and suspend cuttings so that they can be removed from the bit path.

The Contractor shall employ measures to collect and store drilling fluid as necessary to prevent migration or spilling of drilling fluids onto adjacent roadways, properties, and storm drains. All remaining or excess drilling fluid shall be disposed of in accordance with State or Federal regulations and/or permit conditions.

16.04 PIPE INSTALLATION

- A. A qualified representative of the Contractor shall be in direct charge and control of the HDD operation at all times. The representative shall be thoroughly knowledgeable of the equipment and procedures to be performed, and shall be continuously present at the Project site during directional drilling operations.
- B. Before beginning the HDD operation, the Contractor shall verify all existing utilities that are to be crossed, using subsurface utility engineering (vacuum excavation), exposure by utility owner, or other approved method. Adjustments in the vertical alignment shall be made to provide a minimum of 12 inches clearance between the reamer and the existing utilities being crossed, as shown on the Plans, directed by the Engineer, or required by Permit. Change in vertical alignment shall be made gradually and shall not exceed the manufacturer's recommendation for minimum allowable bending radius, unless approved by the Engineer. Pipe sections that are discovered to have cuts or gouges in excess of 10 percent of the wall thickness of the pipe shall be cut out and removed. These removed sections shall not be used. The undamaged portions of the pipe then shall be rejoined.
- C. The Contractor shall have properly working gauges which register the tensile force being used to pull the pipe section into the reamed borehole. The maximum allowable pulling force on the section of pipe during installation shall be in accordance with ASTM F1804 and the manufacturer's recommendations. A complete log shall be furnished to the City showing the tensile force used to pull the pipe section into the borehole.
- D. Pipe sections shall be installed in 300-foot to 500-foot pulls, unless approved otherwise, in order to minimize the number of boring pits and equipment setups. In no case shall the pipe be installed at less than the minimum depths of cover or clearances as specified. Elevation readings shall be recorded at a minimum of every 10 feet and shown on the record drawings, or as directed by the Engineer.
- E. The pipe installed in conformity with this Section shall be pulled through and installed in a previously excavated HDD pilot hole. The pilot hole shall have been enlarged, by using a reamer tool, to the required size to accommodate the pipe. The enlargement to ease installation shall not allow the possibility of cavity formation or future settlement. The pullback tension on the pipe shall be continuously monitored during pullback, to prevent exceeding the maximum tension allowed, certified, or recommended by the pipe manufacturer. Pipe shall be pulled in one continuous length without pause, to minimize sticking; when finished, adequate pipe shall protrude a minimum of 2 feet beyond the bore hole limits. During pullback, the drill pipe shall be connected to the pipe using a pull head or pulling eye and a swivel. The swivel shall be used to prevent rotational torque from spinning the pipe or conduit. The enlargement reamer shall be placed between the pull head and the drill pipe to ensure that the hole remains open and to allow more lubricating fluid (drilling fluid) to be pumped into the hole during the pullback. The entrance pit and a pathway for the pipe to be pulled through shall have been cleared of debris that could cut or gouge the pipe. Pipe shall be placed on sufficiently sized rollers during the pull. A sufficient number of rollers shall be used to prevent sagging of the pipe.
- F. If the pipe is withdrawn from the borehole, it shall be re-inspected on all sides for gouges prior to being pulled through again.

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- G. If an annular area remains at the ground surface between the pipe and the soil after installation of the pipe, the annular area shall be grouted with standard cement to a point where the ground cover over the borehole exceeds 15 feet. Up to 8 percent gel can be mixed with the cement.

All abandoned boreholes shall be grouted with standard cement from the surface opening of the borehole to a point where the ground cover over the borehole exceeds 15 feet.

16.05 MARKING THE INSTALLATION

- A. After installation, the Contractor shall paint seawall caps, and other hard surfaces as directed, with permanent 12-inch long paint stripes above the pipe. The paint color shall be:

<u>Pipe Use</u>	<u>Color Coding</u>
Potable Water	Safety Blue
Sanitary Sewer	Safety Green
Reclaimed Water	Safety Purple

In addition, the Contractor shall install a continuous metal tape, equal to Teratape, 1 foot above the pipe, at each boring pit and at locations where installation was by the open cut trench method. Tape shall be marked to identify the pipe use as specified here or as approved.

- B. At underwater crossings, the Contractor shall furnish and install a 9-inch by 9-inch sign reading "CAUTION BURIED FORCE MAIN OR BURIED WATER MAIN -- CALL CITY OF ST. PETERSBURG 24-HOUR CONTACT NUMBERS 893-7261 AND 893-7761" as shown on the Plans.

16.06 HYDROSTATIC TESTING AND DISINFECTION OF HDPE PIPE

After completion, the pipe shall be tested and disinfected in accordance with the Technical Specifications section headed "Pressure Pipe Construction," with the following modifications:

A. Test Duration

The total test time including initial pressurization, initial expansion, and time at test pressure, must not exceed 8 hours. If the test is not completed due to leakage, equipment failure, etc., the test section shall be depressurized and allowed to "relax" for a minimum of 8 hours before it is brought back up to test pressure.

B. Monitored Make-up Water Test

The test procedure consists of initial expansion phase and test phase.

1. Initial Expansion Phase

During the initial expansion phase, the test section is pressured to the test pressure, and enough make-up liquid is added each hour for 3 hours to return to test pressure.

2. Test Phase

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The test phase follows immediately, and shall be either 2 or 3 hours. At the end of the time test, the test section shall be returned to test pressure by adding a measured amount of liquid. The amount of make-up liquid added shall not exceed the following values plus allowable leakage:

Allowance for Expansion Under Test Pressure*
Allowance for Expansion per 100 Feet of Pipeline
(gallons per hour)

	Nominal Pipe Diameter (inches)							
	2	4	6	8	12	16	20	24
Test Pressure								
2 Hours	0.11	0.25	0.60	1.00	2.30	3.30	5.50	8.90
3 Hours	0.19	0.40	0.90	1.50	3.40	5.00	8.00	13.30

* Applies to test period and not to initial expansion phase.

Allowable Leakage per 100 Feet of Pipeline
(gallons per hour)

	Nominal Pipe Diameter (inches)							
	2	4	6	8	12	16	20	24
Test Pressure								
100 psi	.02	.03	.05	.06	.09	.12	.15	.18
150 psi	.03	.04	.06	.07	.11	.15	.18	.22

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SECTION 17 – SPECIFIC PROVISIONS

17.01 GENERAL

This Section amends, enhances or otherwise revises Sections 2 through 16 of the Technical Specifications. Subsection 17.03 specifies additional supplemental requirements.

17.02

17.03

17.04

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NO TEXT THIS PAGE

SECTION 18 - MILLING AND RESURFACING

18.01 GENERAL

The Work in this section includes furnishing of materials for constructing and restoring roadway surfaces by mechanical grinding to remove existing asphaltic concrete and concrete overlay of City roadways.

The quality of workmanship and materials used in restoration shall produce a surface equal to or better than the condition before the Work began.

18.02 DATA TO BE SUBMITTED

The Contractor shall submit Shop Drawings, and Samples where specified, in accordance with the *General Conditions, Article 36*, for the following materials:

Asphaltic Concrete
Prime and Tack Coats

The Contractor shall submit to the Engineer in writing the proposed asphalt design mixes and sufficient samples for study and testing.

18.03 WORK SCHEDULE

Normal working hours are 7 a.m. to 5 p.m., Monday through Friday. Work on holidays, weekends, and evenings will only be done if approved by the Engineer.

The Work to be accomplished under this project has been grouped into various areas within the City. The Engineer will assign work to the Contractor an area at a time. The Engineer may request the Contractor to furnish a schedule at the end of each week for the following week's work to aid in scheduling City personnel to the best advantage of the Contractor and the City.

The Contractor shall schedule the Work so as to maintain at least one-way traffic and shall provide effective dust control at all times. Two-lane traffic shall be maintained wherever possible.

No interruption of access to property shall be made unless prior arrangements acceptable to the occupant or owner of the affected property have been made by the Contractor in writing.

A minimum of 24 hours before start of paving work at each location, the Contractor shall notify in writing, in a manner acceptable to the Engineer, all occupants of property abutting the Work as to the scheduled time and date of paving work. Notices must contain the Contractor's superintendent phone number to resolve complaints or claims and the phone must be manned. The door hanger must be approved by Engineer prior to beginning the Work.

18.04 ROADWAY BASE

Roadway base material shall be asphalt.

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Asphalt base shall conform to all applicable requirements of DOT-SSRBC Section 331 (Type III). Reclaimed asphalt may be utilized in asphalt roadway base materials in accordance with DOT-SSRBC Article 531-2.2.4. The proportion and properties of reclaimed asphalt shall be provided in the design mix submittals.

Construction methods shall conform to all applicable requirements of DOT-SSRBC Sections 200, 250, 270, and 280. Compaction requirements shall be limited to the maximum density obtainable by hand tamping the base material in 2-inch lifts.

18.05 PRIME AND TACK COATS

Prime and Tack Coats shall conform to all applicable requirements of DOT-SSRBC Article 300-2.

All asphaltic concrete base courses shall be given a prime coat, of the type and rate as specified in DOT-SSRBC Section 300, prior to application of the asphaltic concrete surface. A tack coat shall be applied to asphaltic concrete base courses if the prime coat has lost its bonding effect, as ordered by the Engineer. Tack coats for hot bituminous courses shall be required between courses and for asphaltic base.

18.06 ASPHALTIC CONCRETE SURFACE COURSE

Surface course shall be constructed of plant mixed Type SP-1, S-1, or S-111 asphaltic concrete, where directed by the Engineer. The thickness of the surface course lift shall not exceed 2 inches. Construction material and workmanship shall conform to applicable requirements of DOT-SSRBC Sections 320, 330, 331, and 332. Asphaltic concrete surface course shall conform to all applicable requirements of DOT-SSRBC Section 333 (Type III), for plant mixed asphalt.

18.07 STREET RESURFACING WORK

The Contractor shall clean, to the satisfaction of the Engineer, existing surfaces to be resurfaced and shall maintain said clean surfaces until completion of resurfacing work. Prior to the Contractor's sweeping-cleaning operations, the City's Pavement Maintenance Division of the Engineering, Stormwater & Transportation Department, if given a minimum of 48 hours notice by the Contractor, will schedule to scrape and pull the curb line where there are heavy accumulations of dirt and/or debris. The Contractor shall furnish and apply the tack coat prior to placing of the asphaltic concrete.

Where it becomes necessary, the Contractor will adjust manhole rings as directed by the Engineer. Manhole rings will be adjusted by the use of adjustment rings furnished by the City, and will be placed just ahead of the paver so that they will not be affected by traffic. All such work shall be accomplished as ordered by the Engineer.

At streets intersected by streets being resurfaced, resurfacing shall extend onto the intersecting street to the pedestrian crossing turns and over the areas along the radii of all returns, so as to maintain the drainage pattern of the intersection. At the pedestrian crossing, the resurfacing shall be feathered into the existing pavement of the intersecting street, or at the direction of the Engineer's on site representative.

Saw cut butt joints are required at the termination of all new paving sections.

Alleys and parking lots must be FREE of all standing water, and water must run to intended drainage system, before acceptance by the Engineer.

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Sanding with asphalt all exits from paving operation: sanding shall be at least the length of dump truck minimum and sanding is to be rolled.

Contractor must have on job daily a mobile pick-up sweeper, with capability to water ahead of sweeping to reduce dust problems.

Contractor must have capability to flood alley with water to insure proper drainage upon completion of paving operations.

All paving will be back rolled without exception. Roller pattern will be submitted prior to starting contract.

18.08 COLD MILLING WORK

A. Scope

The work specified in this section consists of removing existing asphaltic concrete pavement to improve the ride characteristic or to lower the finished surface adjacent to existing curb prior to resurfacing.

Transporting and stockpiling the milled asphalt pavement to the designated storage area will be the responsibility of the Contractor.

The salvaged material from this project shall remain the property of St. Petersburg.

Any utility work needed will be accomplished concurrently with this construction contract by the utility agencies. Where utility work must be coordinated with the construction operations, the portion of the anticipated adjustment period covering such concurrent work may not begin on the day the milling commences and may not be consecutive working days.

More precise scheduling to accomplish utility work in the most expeditious manner that is feasible should be coordinated with each utility agency with ample time before start of construction.

B. Equipment

The equipment for this operation shall be a machine capable of maintaining a depth of cut and cross slope which will achieve the results specified herein. The machine shall be equipped with automatic grade controls which operate by sensing from one or more skids moving along the pavement surface and where required shall produce a skid resistant surface texture. The machine shall be equipped with a means to effectively limit the amount of dust escaping from the removal operation.

It shall be the Contractor's responsibility to familiarize himself and comply with all such local regulations as well as State and Federal rules and to obtain all necessary permits.

C. Construction

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The existing pavement shall be removed to varying depths in a manner which will restore the pavement surface to a uniform longitudinal profile and cross slope of 1/4 inch per foot. Minimum removal depth shall be 1 inch on residential streets, and 1-1/2 inches on arterials, or as directed by the Engineer. The longitudinal profile of the milled surface shall be established by skid sensor on the side of the cut nearest the centerline of the road. The cross slope of the milled surface shall be established by a second skid sensing device near the outside edge of the cut or by an automatic cross slope control mechanism. The Engineer may waive the requirements for the automatic grade or cross slope controls where the situation warrants such action. The milling pattern, in conjunction with the lay-down operation, will be approved by the Engineer prior to starting each phase.

Saw cut butt joints are required at the termination of all paving sections.

At all existing speed humps on roadways to be paved, either the entire street shall be milled except for the speed humps before paving or a section of roadway 30' in length the full roadway width on each side of each speed hump shall be milled to maintain the original cross-section and transitions to all speed humps. Alternatively, each existing speed hump may be overlaid to maintain original transitions and cross sections with asphalt paid at contract price for residential S-III pavement.

The Contractor may elect to make multiple cuts to achieve the required pavement configuration or depth of cut if approved by the Engineer.

The milling machine shall be operated to effectively minimize the amount of dust being emitted from the machine. Pre-wetting of the pavement may be required.

Prior to opening an area which has been milled to traffic, the pavement shall be thoroughly swept with a power broom or other approved equipment to remove the greatest extent practicable, fine material which will dust under traffic. This operation shall be conducted in a manner so as to minimize the potential for creation of a traffic hazard and to minimize air pollution.

The milled surface shall be swept with a mechanical-type sweeper prior to placing the new asphalt concrete.

D. Finished Surface

Pavement is to be constructed over the milled surface and shall have a texture which will produce good bonding.

The finished surface shall have a reasonable uniform texture and shall be within 1/4 inch of a true profile grade and shall have no deviation in excess of 1/4 inch from a straight edge applied to the pavement perpendicular to the center line. Areas varying from a true surface in excess of the above state tolerance may be accepted without correction if the Engineer determines that they were caused by pre-existing condition which could not have reasonably been corrected by the milling operations. Any unsuitable texture or profile, as determined by the Engineer, shall be corrected by the Contractor at no additional compensation.

The Engineer may require re-milling of any area where a surface lamination causes a non-uniform texture to occur.

SECTION 19 - FINISH COATING

19.01 DESCRIPTION

The Work specified under this Section shall include furnishing all materials, equipment, labor, and incidentals for surface preparation and application of a finish coating to concrete bridge as shown on the Plans. Surface preparation and application of the finish coating shall be accomplished in accordance with the manufacturer's recommendations and these Specifications.

19.02 MATERIALS

The applied finish coating shall be TAMMSCOAT FDOT Class 5 or approved equal.

A. Packaging and Identification

The applied finish coating shall be delivered to the Project in the unopened, sealed containers with the manufacturer's label identifying the product and with numbered seals intact. Each container shall be clearly marked by the manufacturer with the following information:

1. Manufacturer's name and address.
2. Product name.
3. Date of manufacture.
4. Expiration date.
5. Lot identification number.
6. Container serial number.

B. Manufacturer's Certification

The Contractor shall submit a notarized certification from the applied finish coating manufacturer attesting that the material delivered to the Project is of identical composition and manufacture as the material that was previously submitted to the Engineer for pre-approval. The certification shall identify the serial numbers of the containers certified. This requirement shall apply to each lot of material delivered to the Project.

C. Materials Sampling for Tests

The Engineer may require testing of samples from each lot or container of materials delivered to the Project or from containers at the point of use. When samples are required, the Contractor shall furnish samples in accordance with the Engineer's instructions to a certified test lab. These samples may be used to ascertain authenticity of the materials delivered or to determine continued compliance with the acceptance test performance requirements outlined in Florida Test Method FM 5-522 and 926-16.

D. Storage of Materials

Materials delivered to the job site shall be stored in original unopened containers within an appropriate storage facility. The storage facility shall provide protection from the elements and safe and secure storage of the materials.

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E. Unused Material in Opened Containers

Unused materials in opened containers shall not be returned to storage for later use. Such material shall either be applied to appropriate areas on concrete surfaces or it shall be removed and disposed of at locations off site by the Contractor.

19.03 SURFACE PREPARATION

A. General

Concrete surfaces to receive a finish coating shall be prepared in accordance with these specifications dependent on whether the surfaces are of recently cast concrete (new construction).

B. Surface Preparation for Recently Cast Concrete (New Construction)

Substances such as dust, grime, dirt, curing compounds, form oil, debris, etc. shall be removed by methods acceptable to the Engineer and in accordance with the sealer manufacturer's recommendations, such as: water blasting, light sandblasting, or wire brushing.

C. Application of Finish Coating Materials

1. General

The finish coating shall be applied only to surfaces which have been prepared in accordance with these Specifications and approved by the Engineer. Application of the materials shall be in accordance with these Specifications and the manufacturer's recommendations.

For recently cast concrete (new construction), the application of the sealer and finish coating shall be coordinated by the Contractor to provide at least the minimum concrete curing time required by sealer manufacturer's recommendations.

2. Application Equipment

The finish coating shall be applied using heavy duty spray equipment, stiff brushes, or rollers.

19.04 ACCEPTANCE

Acceptance of the finish coating application will be made when the Engineer determines that all surface areas to be coated have been properly cleaned and the finish coating has been applied within the required rates of application.

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SECTION 20 - PAY ITEM DESCRIPTIONS

20.01 INTRODUCTION

It is the intent of the City to itemize major construction associated with the Project as Pay Items in the Proposal, and specify method of measurement and payment for all listed Pay Items. As may be noted below, incidental work which may be associated with a specific Pay Item is to be included in the cost proposed by the bidding contractor for that Pay Item. The City will not allow for additional compensation beyond those Pay Items included in the Proposal. It is important therefore that all Bidders fully acquaint themselves with all Plans, Specifications, City Standard Details, and other details pertaining to the Work.

Work not shown or called out in either the Plans or the Specifications, but necessary in carrying out the intent of the Project or in the complete and proper execution of the Work, is required and shall be performed by the Contractor as though it were specifically delineated or described. No additional compensation will be considered for this associated and necessary Work.

The Contractor shall not use contingency Pay Items without prior written approval from the Engineer.

Pay Items have a prefix to assist the City in charging the Work to the proper accounting code and to assist in describing the Scope of Work. If no Pay Item exists for Work within a prefix class for that type Work, a similar Pay Item in another prefix may be used, as approved by the Engineer.

Prefixes used are:

- G - General
- R - Roadway
- D - Storm Drainage
- S - Sanitary Sewer - Gravity (future)
- F - Sanitary Sewer Pressure Mains
- P - Reclaimed Water Mains
- W - Potable Water Mains
- M - Miscellaneous
- H - Salvage
- C - Surface Restoration
- N - Resurfacing
- B - Structural Repair (future)
- A - Channel Dredging (future)
- L - Lift Station Renovation (future)
- Z - Gravity Pipe Rehabilitation (future)

20.02 GENERAL - G

Work under this classification applies to Work related to other prefix classifications.

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Project No.

Pay Item G-1.1 Mobilization

Payment for mobilization will include costs associated with preparatory work and operations necessary to begin work on the Project, including but not limited to those operations necessary for the movement of personnel, equipment, supplies, and incidentals to the Project site(s), and for the establishment of temporary offices, buildings, safety equipment and first aid supplies, sanitary and other facilities as required by the Plans and Specifications and all applicable federal, state, and local laws and regulations.

The cost of bonds and any other required insurance, consideration for indemnification to the City and the Engineer, and any other pre-construction expenses necessary for the start of the Work, excluding the cost of construction materials, shall also be included in this Pay Item.

The Work specified under this Pay Item will be paid for at the Contract lump sum price, in accordance with the following schedule:

<u>Percent of Original Contract Amount Earned</u>	<u>Allowable Percent of the Lump Sum Price for Mobilization (*)</u>
5	25
10	50
25	75
50	100

* Partial payments will be limited to 10 percent of the original Contract amount for the Project. Any remaining amount will be paid upon completion of all Work on the Project, including final punch list Work items.

Pay Item G-2.1 Traffic Control

Payment for traffic control will include maintaining traffic within the limits of the Project for the duration of the construction period as shown on the Plans and in accordance with the requirements of DOT-SSRBC Section 102. Payment for pavement marking restoration and painting bridge numbers will be included in the traffic control Pay Item. Pavement striping shall be in accordance with DOT-SSRBC Section 711. Paint for bridge numbers shall be in accordance with DOT-SSRBC Section 710.

Payment for traffic control will be lump sum payable for each Project location in an amount equal to the percentage of the original Contract amount earned at the time of application for payment.

Pay Item G-3.1 Clearing and Grubbing

Payment for clearing and grubbing will include all clearing, grading, and excavation necessary to prepare the surface for construction of the Work. Payment will be a lump sum and will include disposal of excavated material such as brush, rubble, roots, stumps, and other debris.

Project No.

Payment for clearing and grubbing will also include the following items: removal and disposal of all abandoned storm sewer pipe, pressure pipe, drainage structures, and endwalls; removal and disposal of existing concrete and flexible pavement, sidewalks, curb, curb and gutter, fences, gates, planters, signs, and abandoned private utilities; providing all necessary onsite fill, and placing, compacting, and grading the resulting excavation or any existing ditches and swales; and plugging abandoned drainage facilities. Additional payment will be made for filling abandoned storm drain pipes if ordered or shown. The price bid shall include meeting the requirements of the St. Petersburg City Code for Tree and Mangrove Protection.

Pay Item G-3.2 Excavation, Unsuitable Material

Payment for excavation of unsuitable material will include excavation and disposal of unsuitable soft material uncovered under the ground surface and as approved by the Engineer. Unsuitable material shall conform to material classifications as specified and approved by the Engineer.

Vertical measurement shall commence at the bottom of conduits (pipes) and at the bottom of roadway stabilization and structure stabilization as approved by the Engineer.

Payment will be per cubic yard of material removed and disposed, as measured by truckload or other method agreed in advance, and will include the cost of the replacement and compaction of the removed material with alternative material acceptable to the Engineer.

Pay Item G-3.3 Excavation, Rock

Payment for excavation of rock will provide for excavation of solid material that cannot be removed with standard trench excavating equipment, and for the removal of all rocks larger than 1 cubic yard. For payment purposes, the measurement of rock excavation shall be on the basis of vertical trench walls, with width based on the trench width at the top of the pipe. The price quoted shall be per cubic yard removed from the site, and shall include the backfill with approved compacted material.

Pay Item G-3.4 Excavation, Muck

Payment for excavation of muck and other soft unsuitable material will include excavation and disposal of muck or other unsuitable material encountered below pipe invert elevation, and backfill with approved compacted material. The price quoted shall be per cubic yard of material excavated and shall include backfill, compaction, and removal of any muck or other unsuitable material from the Work site.

Pay Item G-4.1 Borrow Material

Payment for borrow material will be made per cubic yard of material delivered to the site, placed and compacted within the limits approved by the Engineer. No payment will be made for material excavated from any location within the Project site limits.

Pay Item G-5.1 Stone Bedding

Payment for stone bedding will be made per cubic yard of material delivered to the site, placed and compacted, where directed by the Engineer.

Pay Items G-6.1 and G-6.2 Concrete, Plain

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Payment for concrete, plain, will be made per cubic yard of concrete delivered and placed. Plain concrete includes, but is not limited to, pipe encasement, supports, and other unreinforced concrete uses requiring minimum forms and finishing.

Pay Item G-7.1 Flowable Fill

Payment for flowable fill will be made per cubic yard of material delivered and placed within the limits approved by the Engineer. Payment will include supports, forms, and bulkheads, as required.

Pay Item G-8.1 Asphalt - Miscellaneous

Payment for asphalt - miscellaneous will be made per ton of asphalt delivered and placed at locations not included under other Pay Items.

Pay Item G-9.1 Sheeting Left in Place

Payment for sheeting left in place will be made per square foot of wood or steel sheeting driven and ordered left in place. No payment will be made for sheeting driven and pulled, or sheeting left in place at the Contractor's option. Measurement for payment shall be based on the horizontal measurement multiplied by the depth of sheeting. No additional payment will be made for overlapping sheeting or bracing.

20.03 ROADWAY - R

Work under this classification includes Work to construct, or reconstruct, a road. Work to restore pavement after installation of pipeline will be paid for under another classification.

Pay Item R-1 Stabilized Subgrade

Payment for stabilized subgrade will be based on the square yards stabilized to the specified thickness. Payment will include furnishing all labor, material, and equipment to obtain the specified LBR and compaction. Payment will be per square yard of compacted stabilization.

Pay Item R-2 Base Material

Payment for base material will be made for [limerock] [asphalt] [reclaimed concrete] [shell] base material as shown, or ordered, for the thickness specified. Payment will include furnishing, placing, and compacting the material. Payment will be per [square yard] [ton] of base material compacted within the payment limits shown on the Plans.

Pay Item R-3 Additional Base Material

Payment for additional base material will be made per cubic yard for material ordered to be placed to depth greater than shown. Payment will be per cubic yard measured in place.

Pay Item R-4 Asphaltic Concrete Surface Course

Project No.

Payment for furnishing and installing asphaltic concrete surface course will be per square yard in place of the thickness and type shown. Payment will include prime coat and tack coats as required and saw cutting to match flush with existing asphalt surfaces. Reduction in the payment unit price, as specified herein, will be made if the delivered mix does not conform to the Technical Specifications, or if the thickness of pavement is less than that specified.

Pay Item R-5 Curb

Payment for furnishing and installing curb will be per linear foot installed. Measurement for payment shall be along the face of the curb.

Pay Item R-6 Brick Surface [text to be written]

Pay Item R-7 Concrete Sidewalk [text to be written]

Pay Item R-8 Hexblock Sidewalk [text to be written]

Pay Item R-9 Concrete Sidewalk Curb Ramp

Payment for concrete sidewalk curb ramp will be at the unit price bid for each concrete curb ramp constructed at the locations shown on the Plans or as directed by the Engineer. Payment will include all labor, material, and equipment required for removing and disposing of existing ramps, and the grading and construction of new ramps.

Pay Item R-10 Driveway [text to be written]

20.04 STORM DRAINAGE - D

The Pay Item(s) provided in the Proposal for Storm Drainage for pipe and structures will be full compensation for all: labor, equipment, services, and materials necessary for construction; dewatering; clearing; removing and disposing of existing abandoned pipe, structures, and/or obstructions; tie-ins; excavating and backfilling, including any sloping, sheeting, or shielding; compacting the backfill; maintaining temporary (driveable) surfaces until the restored surface is constructed; pipe and other incidental items; and any other work and materials necessary to make the installation complete and acceptable, except surface restoration.

Where shown on the Plans, excavating for construction of new storm drainage facilities may require removing portions of existing structures. The cost of such removal, disposal, and replacement shall be included in the price quoted for the applicable Pay Item for construction of the new Work.

Payment for pipe, culvert, inlets, catch basins, manholes, or any drainage structure will be made at the unit rate or lump sum amount regardless of depth. No special payment for construction depth will be made.

Pay Items D-1 through D-3 Reinforced Concrete Pipe

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Project No.

Pipe payment will be per linear foot installed. The length shall be based on the horizontal distance measured from the inside wall of the manhole, catch basin, or box culvert, to the inside wall of the adjoining structure, to the (exposed) face of an endwall or to the flow line of a mitered end structure as appropriate.

No additional payment will be made for obtaining any additional geotechnical information that may be necessary for the Contractor's use in performing various Work required to be completed within the scope of the Project.

Payment for trench excavation, utility pipe supports, backfilling, and compaction shall be included in the unit rate proposed and in accordance with the Plans/Details.

The price bid shall also include the cost of joint construction, joint materials, and connections to proposed and/or existing storm drains and/or drainage structures.

The cost of protecting all shallow pipes and/or conduits (either existing or installed) in or near subgrade or base shall be included in the cost of constructing storm drainage pipe.

Separate Pay Items are provided in the Proposal for excavation of unsuitable material.

Pay Items D-4 and D-5 ERC Pipe

Elliptical reinforced concrete pipe Payment will be per linear foot installed. The length shall be based on the horizontal distance measured from the inside wall of the manhole, catch basin, or box culvert, to the inside wall of the adjoining structure, to the (exposed) face of an endwall or to the flow line of a mitered end structure as appropriate.

No additional payment will be made for obtaining any additional geotechnical information that may be necessary for the Contractor's use in performing various Work required to be completed within the scope of the Project.

Payment for trench excavation, utility pipe supports, backfilling, and compaction shall be included in the unit rate proposed and in accordance with the Plans/Details.

The price bid shall also include the cost of joint construction, joint materials, and connections to proposed and/or existing storm sewers and/or drainage structures.

The cost of protecting all shallow pipes and/or conduits (either existing or installed) in or near subgrade or base shall be included in the cost of constructing storm drainage pipe.

Separate Pay Items are provided in the Proposal for excavation of unsuitable material.

Pay Item D-6 Fiberglass Pipe [text to be written]

Pay Item D-7 Box Culvert

Project No.

Payment for box culvert will include all labor, equipment, materials, excavation, backfill, dewatering, and performance of all operations, in connection with the manufacture and installation of precast or cast-in-place concrete box culverts, complete, including, a 6-inch depth of stone bedding material, wrapping joints, dewatering, sheeting and shoring, and connections. Payment will be per linear foot of box culvert furnished, installed, and approved.

Pay Items D-8 through D-11 Manhole

Payment for manhole structures will be a unit price for each structure constructed. The price quoted shall include constructing the base slab, walls, top slab for Type II or Type III manholes, rings, covers, and all appurtenant hardware, and shall be full compensation for each unit. Method of payment for precast structures will be the same as for cast-in-place structures. All storm drain pipe shall be neatly cut flush with inside walls. The price quoted shall also include restoring all existing drainage pipe connection(s) to proposed structure(s).

Pay Item D-12 Manhole to Pipe Slab [text to be written]

Pay Items D-13 and D-14 Manhole Base Slab [text to be written]

Pay Item D-15 Conflict Structure

Payment for construction of conflict structures will be a unit price bid for each structure and will include all labor, materials, and equipment required to construct the conflict structure as shown on the Plans. Payment for gravity sewer pipe and storm drain pipe through the box will be made under the respective Pay Item for each type of pipe. Payment for surface restoration will be made under the appropriate surface restoration or road construction Pay Item(s).

Pay Items D-16 and D-19 Catch Basin
Pay Items D-20 through D-22 Inlet

Payment for each structure will be a unit price for each type of catch basin or inlet constructed. The price quoted shall include constructing the base slab, walls, wings and concrete cover slabs, including access hole(s), casting(s), nosing channel, reticulate grate(s) and all appurtenant hardware when specified, and will be full compensation for each unit. Method of payment for precast structures will be the same as for cast-in-place or masonry structures. The price quoted shall also include restoring all existing drainage pipe connection(s) to proposed structure(s). All storm drain pipe shall be neatly cut flush with inside walls.

Pay Item D-23 Headstructure [text to be written]

Pay Items D-24 through D-26 FDOT End Sections [text to be written]

Pay Item D-27 FDOT Endwall [text to be written]

Pay Item D-28 (future) [text to be written]

Pay Item D-29 Convert Catch Basin to Manhole [text to be written]

Pay Item D-30 Underdrain [text to be written]

Pay Item D-31 Stormwater Pond [text to be written]

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Project No.

Pay Item D-32 Stormwater Underground Filter [text to be written]

20.05 SANITARY SEWER - GRAVITY - S

[Text for Pay Items S (Sanitary Sewer gravity pipes) to be written.]

[Note: TV inspection of gravity pipeline shall be included in pipe pay item description.]

20.06 PRESSURE PIPE - F, P, AND W

Pay Items F (sanitary sewer pressure mains/force mains), P (reclaimed water mains), and W (potable water mains) are categorized as pressure pipes. Similar methods of payment will be made for each category to ensure that budgetary appropriations are properly charged.

The prices quoted by the Contractor for the various pressure pipe Pay Items shall include all costs of materials, labor, and equipment to fully complete the Work as set forth by the Plans and Specifications. It is not the intent of the City to allow for additional compensation.

The Pay Items provided in the proposal for pressure pipelines will be full compensation for all labor, equipment, and material to construct the pressure pipelines according to the Plans and Specifications, including mobilization, clearing, removing existing abandoned pipe or obstructions, restraining, sloping, sheeting, shielding, excavation, dewatering, backfill, compaction, pressure testing, chlorinating of water lines, flushing, identification tape, as-built drawings, all pipe materials, and any other items necessary to construct the pressure pipelines complete in place, regardless of pay depth.

Surface restoration and payment shall conform to the requirements of the Technical Specifications section headed "Surface Restoration."

Work not specified in either the Plans or the Specifications, but involved in carrying out their intent or in the complete and proper execution of the Work, is required and shall be performed by the Contractor as though it were specifically delineated or described.

Pay Items F-1.1 through F-2.3 Pipe
Pay Items P-1.1 through P-2.3 Pipe
Pay Items W-1.1 through W-2.4 Pipe

Payment for pressure pipe will be per linear foot of pipe furnished, installed, pressure tested, disinfected, and approved. Payment length of pipe shall be based on a horizontal distance measured through and including all appurtenances. Payment per linear foot of pipe installed will include, but not be limited to, the cost of the following:

1. Loading pipe, valves, fittings, and appurtenances at the place of storage, and hauling and unloading the same to the Work area.
2. Providing barricades, warning lights, flags, detour signs, etc., as required to protect the public.
3. Clearing right-of-way as required (removing brush, trees, etc.), excavating, and removing obstacles.

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Project No.

4. Protecting or replacing street name markers, property line markers, and service lines (utilities).
5. Excavating, including any sloping, sheeting, or shielding required to comply with OSHA or State trench safety laws; dewatering; installing pipe; installing sampling or air relief taps and appurtenances where directed; pressure testing; disinfection; backfilling and compaction of the trench; and surface restoration.
6. Furnishing and installing all pipe markings and joint accessories.
7. Furnishing and installing fittings (on 2-inch pipe).
8. Furnishing and installing all color codings on all pipe and above all pipe.
9. Pressure testing and disinfection as specified and as required.
10. Preparing potable and reclaimed water main intersection location drawings (as-builts) and fire hydrant location drawings prior to putting pressure pipelines in service.

Pay Items F-3.1 through F-3.5 Valve and VB
Pay Items P-3.1 through P-3.5 Valve and VB
Pay Items W-3.1 through W-3.5 Valve and VB

Payment will be a unit price for each line valve and valve box furnished, installed, and approved within the various pay sizes. Payment will include the cost of painting the valve box the same color as required to code ductile iron pipe, and all appurtenances necessary to render the installation complete.

Restrained joints will be paid for under a separate Pay Item.

Valve vaults, if shown, will be paid for under a separate Pay Item.

Pay Items P-4.1 through P-4.9 Tapping Sleeve, Valve, and VB
Pay Items W-4.1 through W-4.9 Tapping Sleeve, Valve, and VB

Payment will be a unit price for each tapping sleeve, valve, and valve box furnished, installed, and approved within the various pay sizes. Payment will include the cost of painting the valve box the same color as required to code ductile iron pipe, and all appurtenances necessary to render the installation complete.

The price bid shall include pressure testing the sleeve prior to making the tap, tapping the main, and all else required to render the work complete.

Restrained joints will be paid for under a separate Pay Item.

Valve vaults, if shown, will be paid for under a separate Pay Item.

Pay Items F-5.1 through F-5.2 Thrust Block
Pay Items P-5.1 through P-5.3 Thrust Block
Pay Items W-5.1 through W-5.3 Thrust Block

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Project No.

Concrete thrust blocks detailed on the Plans or as specified herein, shall be furnished and installed on pressure pipe, as directed by the Engineer. Payment for pressure pipe thrust block will be as follows:

1. **2-inch:** Block shall be a standard 16-inch by 8-inch by 8-inch common corner block, with cores filled or solid block. Payment will be a unit price for each block furnished, installed, and left in place.
2. **4-inch through 8-inch:** Block shall be precast reinforced concrete conforming to the Plans and shall be furnished and installed by the Contractor. Payment will be a unit price for each block furnished, installed, and left in place.
3. **12-inch through 24-inch:** Where shown or ordered, block shall be cast-in-place conforming to the Plans, and shall be furnished and installed by the Contractor. Payment will be per cubic yard of concrete placed, including forms, lifting rings, and reinforcement, installed and accepted.

No payment will be made for furnishing, installing, and removing thrust blocks required for temporary blow-off assemblies.

Pay Items P-6.1 through P-6.5 Casing
Pay Items W-6.1 through W-6.5 Casing

Payment for furnishing and installing casing pipe for jacking and boring under roadway, railroads, or as shown on the Plans, will be made per linear foot of casing pipe furnished and installed.

The price bid per linear foot shall also include furnishing and installing blocking and banding, or casing spacers, and end bulkheads as shown on the Plans and in the City Standard Detail. The price bid shall also include restraining the carrier pipe joints inside the casing.

Additional payment, for installing the carrier pipe inside the casing, will be made under the appropriate Pay Item for pipe installation.

Boring and jacking of 2-inch pipe, where required, will also be compensated on a linear foot basis for pipe furnished and installed.

Pay Items F-7.1 and F-7.2 Fittings
Pay Items P-7.1 and P-7.2 Fittings
Pay Items W-7.1 and W-7.2 Fittings

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Project No.

Payment for pressure pipe fittings will be based on the theoretical weight, in pounds, of actual permanent fittings furnished and installed as shown or as approved by the Engineer. The theoretical weight for compact fittings shall be calculated based on the weight listed in ANSI/AWWA C153 ductile iron fittings of the lowest pressure class. The theoretical weight for standard fittings shall be calculated based on the weight listed in ANSI/AWWA C110. This basis for determining fitting weights shall apply for either ductile or cast iron, standard AWWA joints, or modified (restrained) joints, any of which may be furnished and installed as applicable. No additional payment will be made for furnishing and installing all required joint accessories, glands, gaskets, bolts, and joint lubricant for mechanical joints.

Restrained joints will be paid for under a separate Pay Item.

Pay Item P-8.1 Hydrant Assembly
Pay Item W-8.1 Hydrant Assembly

The Contractor shall supply all materials for each fire hydrant assembly installed, and shall include costs of all items necessary to construct the hydrant assembly as shown on the Plans, except for supplying the hydrant which is supplied by the City at the City Utilities Complex, as specified. The Contractor shall pick up and deliver the hydrant to its point of installation.

Payment will be a unit price for each hydrant assembly installed and will include the transportation, installation, and flushing of the hydrants, up to and including 10 linear feet of 6-inch iron pipe, companion gate valve and valve box, and anchor pipe or tee, as shown in the City Standard Details.

Additional payment under the appropriate Pay Items will be made for additional 6-inch ductile iron pipe in excess of 10 feet connecting the valve to the hydrant, for thrust blocks, and for restrained joints.

Pay Item P-8.2 Hydrant Relocation
Pay Item W-8.2 Hydrant Relocation

Payment for hydrant relocation will be for each hydrant relocated and will include all necessary labor and equipment to remove and relocate an existing hydrant as shown or required.

Payment will include costs to dewater the hydrant leg, relocate an existing precast thrust block or remove a poured thrust block, and flush the relocated hydrant.

Additional payment will be made for gate valve, 6-inch pipe, and for furnishing a thrust block if required.

Pay Items P-9.1 through P-9.5 Temporary Blow-off Assembly
Pay Items W-9.1 through W-9.5 Temporary Blow-off Assembly

Temporary blow-off assembly units shall be furnished, installed, and operated at locations indicated on the Plans or where directed by the Engineer. The price bid shall include the cost of furnishing and installing sufficient aboveground and belowground restrained piping to conduct the water to be flushed from the lines to the nearest storm drainage facility.

Temporary blow-off assemblies shall be provided as directed by the Engineer to flush sand and debris from the line prior to chlorination or as ordered by the Engineer. The appurtenances used for a temporary blow-off assembly shall be furnished and removed by the Contractor.

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Payment for temporary blow-offs will be a unit price for furnishing, installing, and operating each temporary blow-off assembly unit installed in each of the sizes as per the Pay Item, and for removing unit, including bends, joint restraint, and all other associated pipe and fittings as shown, and plugging the valve. Any fitting, valve, pipe, or thrust block ordered to be left in the ground will be paid for under the appropriate Pay Item.

Payment for installation of a fire hydrant will be made under the Pay Item for hydrant installation.

Pay Items P-10.1 through P-10.5 Permanent Blow-off Assembly
Pay Items W-10.1 through W-10.5 Permanent Blow-off Assembly

Permanent blow-off assembly units shall be furnished, installed, and operated at locations indicated on the Plans or where directed by the Engineer. The price bid shall include the cost of furnishing and installing sufficient aboveground and belowground restrained piping to conduct the water to be flushed from the lines to the nearest storm drainage facility.

Payment for permanent blow-off assemblies, installed by the Contractor where shown or where directed by the Engineer, will be a unit price and will include installing a permanent tee if required, a permanent valve and valve box, pipe, fittings, meter box, and thrust blocks. The size of the flushing pipe and tee shall be matched to the size of the new line as previously specified or as directed by the Engineer. All fittings and valves shall be installed with retainer glands.

Permanent blow-off assemblies will be paid for separately using the individual Pay Items for fittings, valves, and pipe. No payment will be made for pipe or materials that do not remain in the ground. Payment will include removing the stand-pipe from the blow-off branch to 6 inches to 15 inches below finished grade or as directed by the Engineer, after chlorination.

Restrained joints and surface restoration will be paid for under separate Pay Items.

Pay Item P-11.1 Existing Main Cut & Plug [text to be written]
Pay Item W-11.1 Existing Main Cut & Plug [text to be written]

Pay Items W-12.1 and W-12.2 Polyethylene Wrap

Payment for polyethylene wrap will include all labor and materials to furnish and install polyethylene wrap around the ductile iron pipe, fittings, valves, and hydrants. Payment will be per horizontal linear foot of pipe, valve, and fitting. Payment will include furnishing and installing banding wire, tape, and all else necessary to render the Work complete.

If color coded polyethylene wrap is furnished, the color coding on the pipe may be deleted.

Pay Items P-13.1 through P-13.5 Existing Main Connection
Pay Items W-13.1 through W-13.5 Existing Main Connection

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Payment for pressure pipe connections will be a lump sum price for each location. Pressure pipe connections shall include the following operations to be performed by the Contractor: Advance written notification of shutdown to all affected residents, coordination and scheduling of the operation of valves by City Sanitarian to effect shutdown, thrust restraint of existing mains, dewatering of existing mains, cutting and plugging of existing mains, salvaging of all existing valves and valve boxes to be abandoned, removal of existing pipe and/or fittings, installation of corporation stops, flushing, disinfection by swabbing of the pipe as required, installation of sleeves and other connecting pipe and fittings, pressure testing, and any other operations required to make the connection complete.

The installation of a blow-off assembly, if required, will be paid for under a separate Pay Item.

When the connection is made by a tapping sleeve and valve, or the existing pressure pipeline has been previously isolated by the installation of a valve and no shutdown of service to residents is required, no payment for Work described herein will be made under this Pay Item.

Pay Items P-14.1 through P-14.3 Service Connection
Pay Items W-14.1 through W-14.3 Service Connection

The Contractor shall furnish all labor and equipment to tap and install service connections as specified, per application, to provide for future, replace existing, or reconnect existing customer services where shown on the Plans or directed by the Engineer.

Payment will be a unit price for each size user service installed, and will include furnishing, flushing, tapping, and installing corporation stop, 10 horizontal feet of tubing, curb stop, and the meter yoke on the existing meter, complete and operational.

Additional payment will be made under a separate Pay Item for each additional horizontal foot of tubing required to install curb stop at the proper location and/or far side services.

Payment for pushing, jacking, or boring user services under existing pavements will be made at the unit price for pushing, jacking, or boring user services. This payment will be in addition to the unit payment made for installing service connections.

Pay Items P-15.1 through P-15.3 Tubing, Open Cut
Pay Items W-15.1 through W-15.3 Tubing, Open Cut

Payment for tubing installed for service connections in an open cut will be per horizontal linear foot of tubing furnished and installed where required and approved.

Payment will include all costs to excavate trench, dispose of unsuitable material (including old pavement), backfill, compact, and maintain the surface for traffic until the final restoration is complete.

Pay Items P-16.1 through P-16.4 Tubing/Pipe, Bore or Push
Pay Items W-16.1 through W-16.4 Tubing/Pipe, Bore or Push

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Payment for tubing or 2-inch pipe installed for service connections by boring or pushing under pavement or obstacles will be per horizontal linear foot of tubing or pipe furnished and installed where required and approved.

Payment will include all costs for jacking/boring pits, receiving pits, and surface restoration.

Additional payment will be made for installation of additional tubing installed in open cuts.

Pay Items W-17.1 and W-17.2 Meter Box [text to be written]

Pay Items W-18.1 and W-18.2 Corporation Stop [text to be written]

Pay Items W-19.1 and W-19.2 Relocate Existing Meter [text to be written]

Pay Item P-20.1 Short Tunnel

Pay Item W-20.1 Short Tunnel

Payment for short tunnel to protect trees, shrubs, curbs, and other existing surface improvements, will include furnishing all labor and equipment to construct short tunnels as ordered by the Engineer.

Payment will be per linear foot of tunnel, not to exceed 10 linear feet per tunnel.

Additional payment will be made for installation of the pipe in the tunnel at the unit price bid for pipe installation.

Pay Items F-21.1 through F-21.4 Restrained Joint

Pay Items P-21.1 through P-21.4 Restrained Joint

Pay Items W-21.1 through W-21.4 Restrained Joint

Payment for restraining joints for pipe, fittings, and valves, will include all labor and materials to furnish and install mechanical joint retainer glands, lock slip joint gaskets, or other approved harnessed joints.

Payment for restraining mechanical or slip joints will be made for each joint restrained.

Pay Item F-23.1 Air & Vacuum Valve

Payment to install each air and vacuum valve will include all labor and materials, including the valves, tapping saddle, and valve manhole, as shown or ordered.

Pay Item F-24.1 Pump Around

Payment for sanitary sewer pump around will include all labor and equipment to set up and maintain pump around operation between manholes as required.

Payment will be based on the number of calendar days, or tenths of a day, that pump around operation is required, as approved by the Engineer.

20.07 MISCELLANEOUS - M

Project No.

The Pay Item(s) described under this classification of Work will be full compensation for all labor, equipment, material, and services necessary to construct or install items, structures, and other miscellaneous Work complete which are required of the Project.

Pay Item M-1.1 Traffic Markers

Payment for traffic markers will be a unit price for each FDOT type reflective pavement marker furnished and installed.

Pay Item M-1.2 Striping

Payment for pavement striping will be per linear foot for thermoplastic line striping. Payment will include all labor, materials, and equipment for center line and lane striping, stop bars, turn arrows, and other pavement markings in accordance with the SSRBC and FDOT Index 17346.

Payment for installing and removing temporary pavement marking during the construction period will be included in the Pay Item for Traffic Control.

Pay Item M-2 Riprap

Payment for riprap will be a unit price per cubic yard as measured in place and will include the removal of existing riprap, furnishing all labor, materials, and equipment to place the riprap, and all else as required.

Pay Item M-3.1 Guardrail [text to be written]

Pay Items M-3.2 and 3.3 End Anchorage [text to be written]

Pay Item M-4 Chain Link Fence [text to be written]

Pay Item M-5.1 Handrail, Aluminum

Payment for aluminum handrail will be per linear foot as measured in place and will include all labor, materials, and equipment to install the handrail as shown on the Plans.

Pay Item M-6 Concrete Barrier Wall [text to be written]

Pay Item M-7.1 Floating Turbidity Barrier

Payment for floating turbidity barrier will include all labor, materials tools, equipment, and services required to fabricate, furnish, deploy, secure, and maintain the turbidity barrier throughout the entire duration of the proposed Work, as shown or required. The barrier shall conform to DOT Standards Index 103 and with panel depths as shown on the Plans, as specified, or as ordered by the Engineer. Payment will be a lump sum price and will include removal of the barrier upon completion and acceptance of the Work.

Pay Item M-7.2 Staked Silt Barrier

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A silt barrier shall be staked around all new inlets and catch basins until finish grading and sodding is completed in accordance with the Plans. Payment will be a lump sum price and will include removal of the barrier upon completion and acceptance of the Work.

Pay Item M-7.3 Baled Hay

Hay bales shall be set around all new inlets and catch basins until finish grading and sodding is completed in accordance with the Plans. Payment will be per ton of furnished hay bales set in place, maintenance of same, and its removal/disposal upon commencement of final surface restoration work.

Pay Item M-8.1 Contaminated Groundwater

Payment will be per day (24-hour period) or fraction thereof, of continuous pumping, treatment, and disposal of contaminated groundwater. Payment will include all costs incurred by the Contractor to secure permits for disposal of treated groundwater, having required sampling and testing performed, and for sanitary sewer metering and disposal fees.

Pay Item M-9.1 Contaminated Soil

Payment for removing contaminated soil will be per ton of excessively contaminated soil excavated, stockpiles enveloped in visqueen, and disposed of at an incineration facility as verified by weight tickets received from the incineration facility.

Pay Item M-10 Replace Sanitary Sewer

Payment for replacing existing sanitary sewers where ordered, including house connections, will include all labor and materials for replacing 4-inch through 12-inch vitrified clay, concrete, or PVC sewer pipe with ductile iron pipe or PVC pressure pipe as set forth in these Specifications. Payment will be per linear foot of pipe, and will include all required couplings. Payment will include excavation, backfill, and placement of temporary plugs, as required.

Additional payment will be made for pump around and surface restoration, if approved by the Engineer.

Pay Item M-11 Encase Sanitary Sewer

Payment for encasing existing sanitary sewers will provide for furnishing and installing concrete encasement of sanitary sewer lines as directed by the Engineer. Payment will be per cubic yard of concrete required to encase the sewer pipe, including excavation and backfill.

Pay Item M-12 Restore Irrigation System

Payment for protecting or replacing existing irrigation systems, including piping (1/2 inch to 1 and 1/2 inch) and spray heads, will be made per linear foot of new pipe installed in front of a lot which has a pre-installed underground irrigation system.

Payment under this Pay Item will be made only if the existing irrigation system piping is within the payment limits of the new pipe being installed.

No payment will be made under this Pay Item where installing new pipe adjacent to lawn not served by an underground irrigation system that does not cross or extend into the trench payment limits.

Project No.

Additional payment will be made for replacement of irrigation control valves, control wires, pipes larger than 1 and 1/2 inches, and for reconfiguring an existing irrigation system spray pattern (if ordered).

Pay Item M-13 Allowance for Contract Amendment

The proposal includes an allowance for various extra work contingencies. Any amount of extra work and/or alterations to the proposed Work charged to the allowance shall be fully documented and authorized by the Engineer as follows.

- A. The Contractor shall include in the Contract Total Price the allowance so named in the Proposal Form.
- B. The Contractor shall not proceed on any additional Work to be covered by the allowance until authorized in writing by the Engineer.
- C. The Contractor shall cause the Work so covered to be done by such subcontractors or suppliers, and for such sum within the limit of the allowance as authorized by the Engineer.
- D. Prior to final payment, an appropriate change order will be issued as recommended by the Engineer to reflect actual amounts due to the Contractor on account of Work covered by the allowance, and the Contract Total Price shall be correspondingly adjusted.
- E. The allowance shall not be used for incidental work shown on the Plans or specified in the Contract Documents, or for other work required to render the Project complete.

20.08 SALVAGE - H

Work under this classification includes, where directed by the Engineer, salvaging existing materials and delivering salvaged materials to a designated area of the City Utilities Complex Yard.

Pay Item H-1 Salvage Fire Hydrant

Payment will include all labor and equipment for the removal of a fire hydrant, where directed by the Engineer, delivered to the City Utilities Complex Yard and unloaded in a designated area.

The Contractor will receive no compensation for a hydrant, delivered and unloaded at the City yard, that is not in good condition.

Pay Item H-2 Salvage Valve and Valve Box

Payment will include all labor and equipment for removing the valve and/or valve box where directed by the Engineer, delivering to the City Utilities Complex Yard, and unloading in a designated area.

The Contractor will receive no compensation for valves or valve boxes, delivered and unloaded at the City yard, that are not in good condition.

Pay Item H-3 Salvage Iron Fittings

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Project No.

Payment will include all labor and equipment for removing cast iron or ductile iron mechanical joint fittings, where directed by the Engineer, delivering to the City Utilities Complex Yard, and unloading in a designated area.

Joint accessories, including glands, gaskets, and bolts, shall not be salvaged.

Pay Item H-4 Salvage Manhole Casting/Inlet Grate

Payment for salvaged manhole casting(s) and inlet grate(s) will be made per unit cost of exposing, removing from the Project site, and delivering each manhole frame and casting or inlet grate to the City Utilities Complex Yard, complete as shown on the Plans, as specified, or as ordered by the Engineer.

Pay Item H-5.1 Salvage Concrete Inlet Cover [text to be written]

Pay Item H-6.1 Salvage Brick [text to be written]

Pay Item H-7.1 Salvage Hexblock

Payment for salvaging hexblock (hexagon block) sidewalk will be made per square foot of undamaged hexblock sidewalk placed on pallets and delivered to the City Utilities Complex Yard.

Pay Item H-8.1 Salvage Granite Curb

Granite curb removed from streets or alleys during the course of construction which is not required for restoration shall be delivered (including off-loading) to the City Utilities Complex Yard. Payment will be per linear foot of granite curb removed and delivered to the City yard as noted on the Plans, as specified, or as ordered by the Engineer.

Pay Item H-9.1 Salvage Asphalt Milling

Salvaged asphalt millings removed from streets during the course of construction shall be delivered (including off-loading) to the City Utilities Complex Yard at 327 17th Street North (or to 3000 22nd Street South at the direction of the Engineer). Payment will be per ton of millings transported to the City yard.

The City reserves the right to reject the Bid Item for salvaging asphalt millings, in which case the salvaged millings shall become the property of the Contractor for the Contractor's disposal off site.

Pay Item H-10.1 Salvage Shell Base [text to be written]

20.09 SURFACE RESTORATION - C

Work under this classification includes Work to replace surfaces that were disturbed during the execution of the Project, usually to a condition equal to the preconstruction condition. Payment for surface restoration is limited to the payment limits described in the Specifications or shown on the Plans. Restoration outside the payment limits shall also conform to the Specifications even though no additional payment is made for such Work.

Pay Item C-1 Base Material

Project No.

Payment for base material will be made for [limerock] [asphalt] [reclaimed concrete] [shell] base material as shown, or ordered, for the thickness specified. Payment will include furnishing, placing, and compacting the material. Payment will be per [square yard] [ton] of base material compacted within the payment limits shown on the Plans.

Pay Item C-2 Asphaltic Concrete Pavement [Alt A]

Payment for asphaltic concrete pavement replacement will include furnishing and placing base material and asphaltic concrete pavement within the pavement limits shown and the thickness shown and specified herein. Payment will also include prime coat and tack coats. Payment will be per square foot of asphaltic concrete pavement replaced. No payment will be made for asphaltic concrete pavement if the mix delivered does not conform to the Technical Specifications, or if the thickness of asphalt or base is less than specified.

Pay Item C-2 Asphaltic Concrete Pavement [Alt B]

Payment for asphaltic concrete pavement replacement will include furnishing and placing asphaltic concrete on a prepared base to the thickness shown or ordered. Payment under this Pay Item may also be made for asphaltic concrete overlay of existing pavement, if ordered or shown. Payment will be per ton of material delivered and will include prime and tack coats. Additional payment will be made for restoration of the pavement base material.

Pay Item C-3 Brick Pavement

Payment for brick pavement replacement will be made per square foot of paving brick replaced as required. Payment will include replacement of brick lost or damaged, compaction of the base, and placement of a concrete spacer between the brick and curb (if required).

Pay Item C-4 Curb

Payment for curb replacement will be made per linear foot of curb replaced, as measured along the inside face of curb.

Pay Item C-5 Sidewalk

Payment for sidewalk replacement will include furnishing all labor and materials to replace sidewalks removed or ordered. Payment will be per square foot of sidewalk replaced.

Pay Item C-6 Hexblock Sidewalk

Payment for hexblock (hexagon block) sidewalk replacement will include furnishing all labor and materials to replace hexagonal block removed during construction. Payment will include installation of perimeter curb. Payment will be per square foot of hexblock sidewalk replaced. Additional payment will be made for replacement of hexblock found broken prior to construction. No additional payment will be made for replacement of block broken or lost during construction.

Pay Item C-7 Driveway

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Payment for driveway replacement will include furnishing all labor and materials for saw cutting the old driveway where directed, and constructing the driveway base and top course as specified and shown. Payment will be per square yard of driveway replaced.

Pay Item C-8 Sodding and Seeding

Payment for grass replacement by sodding or seeding will include furnishing all labor and materials to replace the lawn area, including rolling sod, erosion protection, and watering until final acceptance by the Engineer. Payment will be per square foot of sod replaced, or seed placed, within the payment limits shown on the Plans.

Pay Item C-9 Mulching [text to be written]

Pay Item C-10.1 Alley Apron

Pay Item C-10.2 Alley Transition

Payment for alley apron or alley transition restoration will be per square yard, and will include furnishing all labor, materials, and equipment for removing the existing surface, grading, 8-inch limerock base, and 1-inch of asphaltic concrete. Payment will be per square yard.

Pay Item C-11 Resurface Alley or Street [text to be written]

Pay Item C-12 Adjust Manhole or Valve Box Castings

Payment for adjusting manhole, valve box, and meter box castings will be a unit price for each manhole frame and cover casting or valve box casting adjusted to new grade as directed by the Engineer.

20.10 RESURFACING - N

Work under this classification includes milling existing asphalt pavement, heater scarifying existing asphalt pavement, replacing with new asphalt overlay, and all other related work not included under other classifications.

The prices bid shall reflect prices to be held constant during the contract period, regardless of the price variation in bituminous material.

Pay Item N-1.1 Asphaltic Concrete Roadway Overlay, Type SP-1

Pay Item N-1.2 Asphaltic Concrete Alley Overlay, Type SP-1

Pay Item N-1.3 Asphaltic Concrete Roadway Overlay, Type SP-2

Work under this Pay Item provides for all costs for furnishing and placing asphaltic concrete surface course on streets accepted in place by the City. The Price quoted shall be per ton of material placed and compacted, and shall include all required labor, equipment, and materials including all required prime and tack coats. See asphalt concrete pavement for possible deductions.

Pay Item N-2 (Future)

Pay Item N-3.1 Cold Milling

Project No.

Work under this Pay Item provides for all costs for removal of existing asphalt by cold milling, average depth of 1.5 inches of asphalt. The price quoted shall be per square yard of material removed to the thickness specified, and shall include all required labor, equipment, material, handling of salvaged material, and disposal of unsuitable material.

Pay Item N-4.1 Heater Scarifying Roadway

Work under this Pay Item provides for all costs for heater scarifying existing asphalt concrete roadway, including but not limited to: cleaning the surface, scarifying, mixing the recycling agent, mixing the SP-1 asphaltic concrete and redistributing the final mixture, rolling and compacting the placed mixture, and any temporary traffic control markings as required by the Engineer. The price quoted shall be per square yard of material placed, of the thickness specified.

Pay Item N-5.1 Asphaltic Concrete SP-1 (for Heater Scarifier Projects)

Work under this Pay Item provides for all costs for removal for furnishing and placing Type SP-1 Asphaltic concrete for mixing into the scarified material, including but not limited to trucking to job site and placing in mixer. The price quoted shall per ton of material delivered and placed in the mixer.

Pay Item N-6.1 Recycling Agent (for Heater Scarifier Projects)

Work under this Pay Item provides for all costs for removal for furnishing the recycling agent to be mixed into the scarified material at a rate of 0.10 to 0.15 gallon per square yard, including but not limited to delivery to the job site and adding to the mix. The price quoted shall be per gallon of material placed in the mixer.

Pay Item N-7 (Future)

Pay Item N-8 (Future)

Pay Item N-9 (Future)

Pay Item N-10 (Future)

Pay Item N-11 (Future)

Pay Item N-12.1 Adjust Manhole Cover

Work under this Pay Item provides for all costs for adjusting manhole covers to the desired grade by inserting City-furnished adjustment rings (adapters). The price quoted shall be per each and shall include all required labor and equipment. The price shall also include all costs to pick up and deliver the manhole adjustment rings from the City Utilities Complex.

Pay Item N-12.2 Adjust Water Valve Box

Payment will be made for each valve box casting adjusted to new grade as directed by the Engineer. Additional payment will be made for furnishing new valve boxes to replace valve boxes broken prior to commencement of construction.

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