SPECIFICATIONS
AND
CONTRACT DOCUMENTS

FOR

ANNUAL REQUIREMENTS CONTRACT
FOR
WATER, WASTEWATER, NATURAL GAS AND GENERAL (SITE RELATED) SYSTEMS
2026

(VOLUME II OF III)
SPECIFICATIONS

CITY OF ALEXANDRIA, LOUISIANA
(OWNER)

UTILITIES DIVISION

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AUGUST 2026

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The following Contract Documents and Technical Specifications have been prepared under my direct supervision and guidance in conjunction with the Plans and for the explicit use by the Owner and Contractors for the bidding and construction of the project:

CITY OF ALEXANDRIA, LOUISIANA

ANNUAL REQUIREMENTS CONTRACT
FOR
WATER, WASTEWATER, NATURAL GAS AND
GENERAL (SITE RELATED) SYSTEMS
2026

CONSTRUCTION SPECIFICATIONS
DISCIPLINE LEAD SIGNATURES



7-28-2026

CITY OF ALEXANDRIA, LOUISIANA

ANNUAL REQUIREMENTS CONTRACT
FOR
WATER, WASTEWATER, NATURAL GAS AND
GENERAL (SITE RELATED) SYSTEMS
2026

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CITY OF ALEXANDRIA, LOUISIANA

ANNUAL REQUIREMENTS CONTRACT FOR WATER, WASTEWATER, NATURAL GAS AND GENERAL (SITE RELATED) SYSTEMS 2026

PART 3 – GENERAL REQUIREMENTS

Section 03010 - SUMMARY OF WORK
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SECTION 03010

SUMMARY OF WORK

PART 1 - GENERAL

1.1 Scope:

A. The intent of this Program is to obtain a one (1) year term Annual Requirements Contract for repairs, upgrades, etc. for Water, Wastewater, Natural Gas and General (Site Related) improvement items and other public utility assets as defined by the City of Alexandria "Utilities Division". The contract term may be extended in 12 month (1 year) periods for up to two (2) additional years by mutual consent.

B. Where directed, the work shall include:

- PART 4 - WATER:
  Installation of new and/or repairs to existing water distribution system, including but not limited to; mains, services, taps, saddles, valves, fittings, locations and inspections to verify work, flushing, line loops to eliminated dead-ends, reconnection of meters on OWNER service side, sampling stations, disinfection connections and disinfection testing assistance, pressure testing, etc., including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and/or as directed by the ENGINEER.

- PART 5 - WASTEWATER:
  Installation of new and/or repairs to existing sanitary sewer collection system, including but not limited to; mains, services, taps, fittings, locations and inspections to verify work, point repairs on mains and services, sewer manholes, new, replaced, repaired or rehabilitated, cured-in-place pipe (CIPP), pipe bursting, TV inspection, cleaning and/or jetting, root removal and/or treatment, by-pass flow, flow measurement monitoring, measurement and reporting, etc., including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and/or as directed by the ENGINEER.

- PART 6 - NATURAL GAS:
  Installation of new and/or repairs to existing natural gas distribution system, including but not limited to; mains, services, taps, fittings, regulators, meters, meter settings, purging, abandoning, location and inspections to verify work, valves, casing, cathodic protection, warning signs, services protection railing, valves and valve boxes, curb stops, hot taps, etc., including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and/or as directed by the ENGINEER.

- PART 7 - GENERAL (SITE RELATED):
  Installation of new and/or repairs to existing site work area(s), including but not limited to; demolition, clearing, bedding, "select material" backfill, foundation materials, surface repairs including streets, drives, sidewalks, etc., traffic control and signage, temporary and permanent, sheeting and bracing, boring and jacking, etc., including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and/or as directed by the ENGINEER.

1.2 Task Order Basis: Work is planned to be undertaken on a Task Order basis for projects identified by the City of Alexandria "Utilities Division".

1.3 Minimum and Maximum Task Orders: The minimum value of any Task Order will be $15,000. The estimated maximum value of a Task Order would be $500,000. The maximum value of Task Orders issued within a single one (1) year period is estimated to not exceed $1,000,000. The maximum values may be exceeded by mutual agreement between OWNER and CONTRACTOR. The contract period may be renewed or extended by mutual agreement for up to three (3) years, in one (1) year increments (i.e. to subsequent extensions of the initial contract term).

1.4 Prices and Payments: The Unit Price Form which includes various and numerous Bid Items does not constitute a complete outline of the work to be performed by the CONTRACTOR; but is merely a list of work items to which unit prices are to be applied in computing CONTRACTOR's compensation. The estimated quantities shown are solely for the purpose of facilitating a comparison of Bids. It is possible that work under any particular bid item(s) may not be utilized/initiated over the term of the contract. The Owner shall not be responsible for any claimed losses or damages if such a situation should occur.

1.5 Pricing Adjustments: The unit prices shall not be adjusted during the entire term of the Contract; therefore, bidders, when preparing pricing should take into account inflation and other market forces.

1.6 Workmanship and Materials:

A. Work shall be performed and completed in a thorough, workmanlike manner and in accordance with the latest proven practices of the trade by thoroughly skilled and experienced workmen.

B. Work shall be performed and completed using the latest standard industrial practices, notwithstanding any omissions from these Specifications or Drawings.

C. Materials furnished shall be new and conform to Technical Specifications.

D. CONTRACTOR shall be required to remove all materials from the work site that do not conform to Specifications and shall replace them with materials that conform.

E. CONTRACTOR shall immediately correct deficiencies discovered during work or after completion, within the statutory one (1) year warranty period for each Task Order.

1.7 Notifications and Owner/Engineer Field Observations:

A. The CONTRACTOR shall be required to notify the ENGINEER before the initiation of any work under an issued Task Order.

B. OWNERS representatives and ENGINEER shall be authorized to observe all materials and work performed. Such observation will not relieve the CONTRACTOR from any obligation to perform the work in accordance with the requirement of these Specifications.

1.8 Task Order Procedures:

A. A Task Order may be issued at any time within one (1) year of the date of the Agreement; and within the extended term of an additional two (2) years in one (1) year increments by mutual consent.

B. A list of utility work will be planned or proposed by the City of Alexandria "Utilities Division".

C. The Utility Division will provide a listing of approved Task Order consideration and instruct the ENGINEER to coordinate the Task Order work.

D. The ENGINEER will coordinate a site inspection of each Task Order with the CONTRACTOR. Utilizing the unit prices included in this Contract, the ENGINEER and CONTRACTOR shall develop a quantity takeoff and make an extension of unit prices to develop an estimate of the work for each location.

E. Materials to be incorporated into the Task Order shall be provided by the CONTRACTOR.

F. Decisions as to the scope of each Task Order will be made by the ENGINEER.

G. A Notice to Proceed will be issued for each Task Order(s). Upon acceptance, all Task Order(s) will be issued a Beneficial Use document at which time will begin the one (1) year warranty period for each Task Order(s) issued such. Upon the end of the initial one (1) year Contract, all Task Order(s) issued the global Beneficial Use Certificate (within the initial one (1) year Contract) will be globally recorded at the Rapides Parish Clerk of Court and Ex-Officio Recorder of Mortgages' Office and simultaneously begin the 45 day Lien period for all Task Order(s) issued the global Beneficial Use Certificate within the initial one (1) year Contract.

H. Payment in the amount of the value of the work completed will be made to the CONTRACTOR, less 5% retainage, within thirty (30) days of presentation of an approved invoice.

I. When all work under a particular Task Order has been completed, the CONTRACTOR shall request an inspection of the Work. The ENGINEER shall schedule an inspection and make a report of his findings. Any deficiencies reported shall be corrected by the CONTRACTOR before a request is made for a follow-up inspection.

J. Upon approval, a Task Order(s) "Beneficial Use" Certificate shall be issued by the ENGINEER to the OWNER. This will begin the one (1) year warranty period.

K. All Task Order(s) completed within the initial one (1) year Contract will be globally recorded as Final Complete which will begin the 45 day Lien period for all accepted Task Order(s) completed within the initial one (1) year Contract. Upon passage of the 45 day Lien period and receipt of a Clear Lien Certificate for the completed Task Order(s), the OWNER will pay the retainage of five (5%) of all Task Order(s) as globally accepted.

L. The one (1) year warranty period for work completed under each Task Order(s) will begin on the date the Utility Division executes the Task Order(s) Beneficial Use document.

M. See "Task Order" Flow Chart attached to the end of this Section for the Task Order development and execution process.

1.9 Specifications:

A. Specifications: The Section of the General Requirements consist of four (4) parts: General, Products, Execution and Measurement and Payment. The General Part contains general requirements which govern the work. The Products and Execution Parts modify and supplement the General Part by providing detailed requirements of the work and shall always govern whenever there appears to be a conflict. The Measurement and Payment Part defines and describes the methods by which the work will be measured and on what basis the payments will be made.

B. Intent:

1. All work called for in the Specifications applicable to the Contract but not shown on the Drawings in their present form or vice versa shall be of like effect as if shown or mentioned in both. Work not specified in the Specifications but involved in carrying out their intent or in the complete and proper execution of the work is required and shall be performed by the CONTRACTOR as though it were specifically delineated or described.

2. The apparent silence of the Specifications as to any detail, or the apparent omission from them of a detailed description concerning any work to be done and materials to be furnished, shall be regarded as meaning that only the best general practice is to prevail and that only material and workmanship of the best quality is to be used, and interpretation of these Specifications shall be made upon that basis.

C. Conflict Between Drawings and Specifications: Where an obvious conflict exists between the Drawings and Specifications, the ENGINEER shall decide which governs and the CONTRACTOR shall comply with the decision. Such decision shall not be grounds for additional payment to the CONTRACTOR, i.e. the CONTRACTOR shall include the price of the most expensive alternative in his Bid.

1.10 Underground Utilities:

A. It shall be the responsibility of the CONTRACTOR to locate all underground utilities that may conflict with the proposed work. The CONTRACTOR shall also comply with the requirements of Section 03016 - Protection of Existing Utilities.

B. The OWNER will assist the CONTRACTOR in locating OWNER'S water, fiber, gas and sewer utilities; however, it shall be the CONTRACTOR'S responsibility for locating and protecting the utilities once located by the OWNER.

C. The CONTRACTOR shall be responsible for repairing all damage done to any underground utilities as a result of construction activities, at no cost to the OWNER.

D. The CONTRACTOR shall contact Louisiana One Call in accordance with Section 03016 - Protection of Existing Utilities.

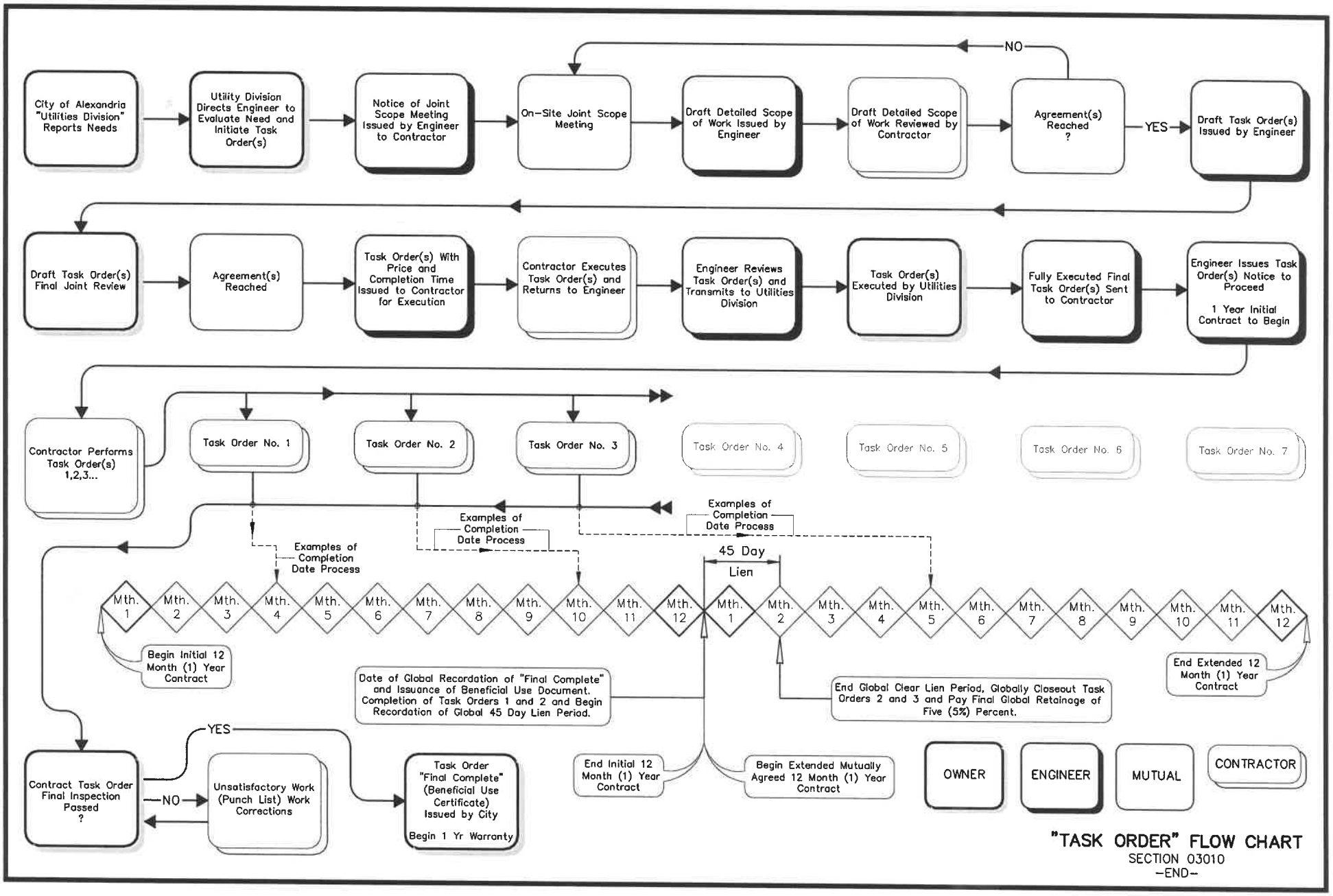
PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 General: Perform all work within the specified limits indicated on the Drawings, and/or as directed by the ENGINEER, all to the OWNER'S satisfaction.

PART 4 - MEASUREMENT AND PAYMENT (NOT USED)

- END OF SECTION -



"TASK ORDER" FLOW CHART

SECTION 03010

-END-

SECTION 03015

GENERAL CONDUCT OF WORK

PART 1 - GENERAL

1.1 Scope: This Section generally describes the manner in which work shall be conducted.

1.2 Coordination of Work: The CONTRACTOR shall be responsible for the coordination of all work so that the project can be completed within the time stipulated in the Contract.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 Handling and Storage:

A. The CONTRACTOR shall, at his own expense, handle, haul, and distribute all materials and all surplus materials for the different portions of the work, as necessary. He shall provide suitable and adequate storage room for materials and equipment during the progress of the work and be responsible for loss, or damage to, materials and equipment furnished by him, until the final acceptance of work.

B. All excavated materials, construction equipment, materials and equipment to be incorporated in the work shall be placed so as not to injure the work and so that free access can be had at all times to all parts of the work and to all public utility installations in the vicinity of the work.

C. Storage charges and demurrage charges by transportation companies and vendors, which result from delays in handling, shall be borne by the CONTRACTOR.

3.2 Work on State Highways and Rights-of-Way: If required, LDOTD project permits will be acquired for this project by the OWNER and will be distributed to the CONTRACTOR at the preconstruction conference. The CONTRACTOR shall comply with all provisions of the permits. The CONTRACTOR shall contact DOTD forty-eight (48) hours prior to beginning work.

3.3 Work on Railway Company Right-of-Way: If required, the OWNER shall into agreement ("Pipeline Crossing Agreement") with the Railway Company to occupy railroad right-of-way for the railroad pipeline crossings or permitted work. The CONTRACTOR shall comply with all the terms and provisions of the "Pipeline Crossing Agreement". Included in the "Pipeline Crossing Agreement" are special notification, insurance, flagging (flagman), inspection and other requirements and associated fees that are required by the Railway Company for conducting work on railroad right-of-way. The cost of these services and fees shall be borne by the CONTRACTOR.

3.4 Sequence of Work: The WORK shall be carried on in such a manner and in a sequence designed so that work performed during each day shall be cleaned and neatly dressed at the end of that day. The WORK in any one area will be carried out so that interruption or access to and from homes and businesses will be minimized; and so that access to the area for pedestrians, fire protection and other vital services can be maintained at least on a limited basis. The OWNER may order a change in the sequence of the work if it is found that the circumstance of the construction operation, a section of the public or private thoroughfare will be blocked off or unduly inconvenienced. The CONTRACTOR will not be allowed to obstruct private driveways or approaches or to dig up or occupy public streets and highways with the materials more than is absolutely necessary for the prosecution of the work.

3.5 Layout of Work: The CONTRACTOR shall lay out his work and shall be responsible for all measurements in connection therewith. The CONTRACTOR shall verify layout with the ENGINEER before commencing work.

3.6 Existing Utilities: See Specification Section 03016 - PROTECTION OF EXISTING UTILITIES.

3.7 Private Property: The CONTRACTOR will at no time use or occupy private property which falls outside of the rights-of-way or servitudes without obtaining authority independently from respective owners. CONTRACTOR shall remove all trash, debris, spoil, etc. that may be left or result from construction and shall not dispose of or leave said material on private property in the general vicinity of the project.

3.8 Preservation of Fences and Existing Vegetation: The CONTRACTOR will preserve and protect all fences and existing vegetation such as trees, shrubs, and grass on or adjacent to the site which do not unreasonably interfere with the construction as may be determined by the ENGINEER. The CONTRACTOR will be responsible for all unauthorized cutting or damaging of fences and trees and shrubs, including damage due to careless operation of equipment. Care will be taken by the CONTRACTOR in cutting fences and in falling trees authorized for removal to avoid any unnecessary damage to fences and vegetation that are to remain in place. Any limbs or branches of trees broken during such operations shall be trimmed with a clean cut and painted with an approved tree pruning compound if required by the ENGINEER. The CONTRACTOR will be liable for and will be required to replace or restore at his own expense all fences and vegetation not protected and preserved as required herein that may be destroyed or damaged. In residential areas, lawns shall be excavated only after the sod or turf has been carefully removed before commencement of trenching operations. Sod or turf will be wetted as required and stored until backfill is complete. Upon completion of backfill the turf and fences shall be replaced in a strictly neat and workmanlike manner, and lawn areas shall be restored as near as possible to their original condition prior to excavation.

3.9 Removal of Ground Water: Any pumping or bailing required to construct the WORK will be done at no extra cost to the OWNER.

PART 4 - MEASUREMENT AND PAYMENT (NOT USED)

- END OF SECTION -

SECTION 03016

PROTECTION OF EXISTING UTILITIES

PART 1 - GENERAL

1.1 Scope: This Section describes the work required to allow for the location and protection of existing underground utilities in the project work area.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 General: It shall be the responsibility of the CONTRACTOR to locate all underground utilities that may conflict with the proposed work. The CONTRACTOR shall be responsible for repairing all damage to underground utilities as a result of construction activities, at no cost to the OWNER. The CONTRACTOR shall contact Louisiana One Call by phone at 811 so that those utilities who participate in the Louisiana Once Call System may mark the field locations of their underground facilities. CONTRACTOR shall also contact owners of other underground facilities that may be affected for information as to their location.

3.2 Test Pits: Test Pits for the purpose of locating existing underground utilities shall be excavated and backfilled in accordance with Section 07160 - Test Pits.

3.3 Existing Utilities: The WORK will be located in the vicinity of existing water, sewer, gas, telephone and electric lines. The CONTRACTOR shall handle his work in a manner so as not to damage the existing utilities. The CONTRACTOR shall support by shoring, ties, or other means, the existing utilities as necessary to prevent damage to them; and shall be responsible for any damage his work does to them. The CONTRACTOR shall repair or pay for any repairs to them occasioned by damage done to them by his work. The CONTRACTOR shall notify the proper OWNER when his work is near their facilities so that they may send persons to advise about the work which may affect their facilities. It will be the CONTRACTOR'S responsibility to locate the utilities in advance of his work, and plan his work ahead so as to best carry on his work in a manner to insure no damage to the existing facilities.

PART 4 - MEASUREMENT AND PAYMENT (NOT USED)

- END OF SECTION -

SECTION 03340

SHOP DRAWINGS, SAMPLES AND PROJECT DATA

PART 1 - GENERAL

1.1 Scope: This section covers the submission and approval of shop drawings, samples, and other relevant project data. A one (1) time all inclusive initial submittal of all pertinent items of materials, prepared by the ENGINEER, for the entire initial one (1) year Contract will be provided to the CONTRACTOR. If material or products are required other than or in addition to the initial approved submittals, they shall be provided at the time of the Task Order that requires such.

1.2 Materials: Only new materials and equipment shall be incorporated in the work. All materials and equipment furnished by the CONTRACTOR to be incorporated in the work shall be subject to the inspection and approval of the ENGINEER. No material shall be processed for, fabricated for, or delivered to the work without prior approval of the ENGINEER.

1.3 Submission Schedule: The CONTRACTOR shall submit data relating to the materials and equipment he proposes to incorporate into the entirety of the initial one (1) year Contract, in sufficient detail to enable the ENGINEER to identify the particular product in question and to form an opinion as to its conformity to the contract requirements. Such data shall be submitted in a manner similar to that specified for shop drawings.

1.4 Samples:

A. If the OWNER so requires, either prior to beginning or during the progress of the work, the CONTRACTOR shall submit samples of materials for such special tests as may be necessary to demonstrate that they conform to the Specifications. Such samples, including concrete test cylinders, shall be furnished, taken, stored, packed, and shipped as directed, at the expense of the OWNER. Except as otherwise specified, the OWNER shall make arrangements for, and pay for, the tests. Any subsequent tests required due to failure of samples to meet specifications shall be at the expense of the CONTRACTOR.

B. When required, the CONTRACTOR shall furnish to the OWNER triplicate sworn copies of manufacturer's shop or mill test (or reports from independent testing laboratories) relative to materials, equipment performance ratings and concrete data.

C. After approval of the samples, data, etc. the materials and equipment used on the work shall correspond therewith.

1.5 Shop Drawings/Submittals:

A. The CONTRACTOR shall submit for approval five (5) print copies of shop drawings of materials fabricated especially for this contract, and of equipment and

materials of which such drawings are specifically requested. Two copies will be returned to the CONTRACTOR.

B. Such drawings shall show the principal dimensions, weight, structural and operating features, performance characteristics and wiring diagrams, space required, clearances, type and/or brand of finish or shop coat, grease fittings, etc., depending on the subject of the drawings. When it is customary to do so, when the dimensions are of particular importance, or when so specified, the drawings shall be certified by the manufacturer or fabricator as correct for this contract.

C. When so specified or if considered by the ENGINEER to be acceptable, manufacturer's specifications, catalog data, descriptive matter, illustrations, etc. may be submitted for approval in place of shop drawings. In such case the requirements shall be as specified for shop drawings, insofar as applicable.

D. No material shall be purchased or fabricated especially for this Contract until the required shop drawings have been submitted and reviewed as conforming to the contract requirements. All materials and work involved in the construction shall then be as represented by said drawings.

E. Prior to submitting shop drawings to the OWNER, the CONTRACTOR shall check thoroughly all such drawings to satisfy himself that the subject matter thereof conforms to the drawings and specifications in all respects.

F. The ENGINEER'S review of shop drawings will follow a general check made to ascertain conformance with the design concept and functional result of the project and compliance with the information given in the contract documents. The CONTRACTOR shall be responsible for dimensions to be confirmed and correlated at the job site; for information that pertains solely to the fabrication processes or to techniques of construction; and for coordination of the work of all trades.

G. The CONTRACTOR shall make any corrections required by the ENGINEER and shall return the required number of corrected copies of shop drawings. The CONTRACTOR shall resubmit shop drawings until approved.

H. At the time of each submission or resubmission, the CONTRACTOR shall direct specific attention, in writing, to deviations that the shop drawings or samples may have from the requirements of the contract documents or corrections required by the OWNER on previous submissions.

I. The ENGINEER'S approval of shop drawings and samples shall not relieve the CONTRACTOR from his responsibility for any deviations from the requirements of the contract documents, unless the ENGINEER has been notified, in writing, and has given his written approval to such deviation, nor shall any approval by the ENGINEER relieve the CONTRACTOR from responsibility for errors and omissions in shop drawings.

J. The CONTRACTOR shall be responsible for and bear all cost of damages which may result from the ordering of any material or from proceeding with any part of work prior to the completion of the review by ENGINEER of the necessary Shop Drawings.

K. The CONTRACTOR shall utilize a Sequential Numbering System for submittals (1-999). Resubmittals or confirming material shall be assigned a letter next to the submittal number, i.e., A - second submittal, B - third submittal, etc.

L. Resubmittals will be handled in the same manner as first submittals. The CONTRACTOR shall direct specific attention to revisions other than the corrections requested by the ENGINEER on previous submissions by written details or markings on the resubmitted Shop Drawings. The CONTRACTOR shall make any corrections required by the ENGINEER.

M. If the CONTRACTOR considers any correction indicated on the drawings to constitute a change to the Contract Drawings or Specifications, the CONTRACTOR shall give written notice thereof to the ENGINEER.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

PART 4 - MEASUREMENT AND PAYMENT (NOT USED)

- END OF SECTION -

SECTION 03350

RECORD DRAWINGS

PART 1 - GENERAL

1.1 Scope: This section covers the requirements for the preparation and submission of Record Drawings.

1.2 General: As part of each Task Order, the CONTRACTOR will be required to provide complete "Record Drawings" of each Task Order completed. The Record Drawings shall be a record of the construction as installed and completed by the CONTRACTOR. They shall include all the information of installed facilities as well as any deviations, modifications, or changes however minor, which were incorporated in the work, all additional work not included in the original Task Order, all changes which are made after final inspection of the contract work and the location and size of all uncharted existing structures encountered.

PART 2 - PRODUCT (NOT USED)

PART 3 - EXECUTION

3.1 Record Drawings: The CONTRACTOR shall prepare Drawings to show as-builts conditions, hereafter called Record Drawings. All changes from the contract documents which are made in the work or additional information which might be uncovered in the course of construction, including uncharted structures, shall be accurately and neatly recorded as they occur by means of details and notes. All changes and/or required additions to the Record Drawings shall be clearly identified in a color contrasting to the blue line record drawing prints. The Record Drawings shall show the following information, but not be limited hereto.

A. The location and description of any utility lines or other installation of any kind or description known to or found to exist within the construction area. The location of exterior utilities includes actual measured horizontal distances from utilities to permanent facilities/features. These measurements shall be within an accuracy range or six (6") inches and shall be shown at sufficient points to permit easy location of utilities for future maintenance purposes. Measurements shall be shown for all change of direction points and all surface or underground components such as valves, manholes, drop inlets, cleanouts, meter, etc. The general depth of range of each underground utility line shall be shown (i.e. 3' to 4' depth). The description of exterior utilities includes the actual quantity, size and material of utility lines.

B. Correct grade or alignment of roads, structures or utilities if any changes were made from Task Order Contract.

C. Changes in design or additional information obtained from the work specified to be prepared and/or furnished by the CONTRACTOR including but not limited to fabrication, erection, installation, details, pipe sizes, etc.

D. The grades of all drainage installed or affected as a part of the Task Order.

3.2 Record Drawing Review: As a part of the prefinal inspection for each Task Order the Record Drawings will be reviewed. They must comply with this specification prior to scheduling the final inspection, and/or prior to Beneficial Use document approved by the OWNER.

3.3 Record Drawing Final Submittal: Prior to receiving the Beneficial Use document, the Record Drawings shall be completed and delivered to the ENGINEER for his review and approval. If, upon review, the drawings are found to contain errors and/or omissions, they will be returned to the CONTRACTOR for corrections. Failure of any CONTRACTOR to make timely delivery of the Record Drawings on any/all items of work will be cause for the OWNER to delay final payment.

3.4 Withholding for Record Drawings: Failure by the CONTRACTOR to maintain current and satisfactory Record Drawings in accordance with these requirements will result in withholding from progress payments an amount determined by the ENGINEER as the value of the subject drawings for each Task Order, and will indicate this unearned amount on payment estimates until the CONTRACTOR has fulfilled the contract requirements.

3.5 Drafting: All additions and corrections to the record drawings shall be neat, clean and legible.

3.6 Record Drawing Designation: When final revisions have been completed, each drawing shall be lettered or stamped with the words "RECORD DRAWINGS" in letters at least 3/16" high and shall include the date of completed Drawings.

END OF SECTION

SECTION 03400

MOBILIZATION

PART 1 - GENERAL

1.1 Scope: This work consists of preparatory work and operations, including, but not limited to, those necessary for the movement of personnel, equipment, supplies and incidentals to the Task Order site; the establishment of other facilities necessary for work on the Task Order; and other pre-construction expense necessary for the start of the WORK excluding the cost of construction materials.

1.2 Mobilization: Multiple Task Orders approved for construction on the same date, by Notice to Proceed, and are separated by less than two (2) road miles shall be issued a single mobilization price combining the total amount of said multiple Task Orders.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

PART 4 - MEASUREMENT AND PAYMENT

4.1 Measurement: Mobilization at each Task Order site, satisfactorily completed, will be measured by Each mobilization actually completed for a given Task Order.

4.2. Payment: Mobilization measured as provided above will be paid and shall constitute full compensation for all preparatory work and operations, including moving of equipment, supplies and incidentals to the project site; the establishment of all other facilities necessary for work on the project, and any other preconstruction expense necessary for the start of the WORK at a given Task Order site, excluding the cost of construction materials. Payment shall not exceed the Max Unit Price specified in Each pay item.

4.3 Pay Item:

Mobilization (For Task Orders Less than $25,000) (Per Notice to Proceed or Task Order Contiguous Location) (Max Unit Price $1,000) (03400)(01) per Each.

Mobilization (For Task Orders Greater than or Equal to $25,000 and Less than $75,000) (Per Notice to Proceed or Task Order Contiguous Location) (Max Unit Price $3,000) (03400)(02) per Each.

Mobilization (For Task Orders Greater than or Equal to $75,000 and Less than $150,000) (Per Notice to Proceed or Task Order Contiguous Location) (Max Unit Price $5,000) (03400)(03) per Each.

Mobilization (For Task Orders Greater than or Equal to $150,000 and Less than $300,000) (Per Notice to Proceed or Task Order Contiguous Location) (Max Unit Price $7,000) (03400)(04) per Each.

Mobilization (For Task Orders Greater than or Equal to $300,000) (Per Notice to Proceed or Task Order Contiguous Location) (Max Unit Price $10,000) (03400)(05) per Each.

- END OF SECTION -

SECTION 03500

TEMPORARY FACILITIES

PART 1 - GENERAL

1.1 Scope: This section covers the installation of temporary facilities for the use of the CONTRACTOR during the construction project.

1.2 Precautions Against Weather: During adverse weather conditions and against the possibility thereof, the CONTRACTOR shall take all necessary precautions so that the work shall be properly done and be satisfactory in all respects. When required, protection shall be provided by use of tarpaulins, wood and building paper shelter, or other approved means.

1.3 Potable Water: The CONTRACTOR shall make all necessary applications and arrangements and pay all fees and charges for any potable water service necessary for the proper completion of the work during its entire progress. The CONTRACTOR shall provide and pay for all temporary connections, meters, etc. The OWNER will provide potable water necessary for hydrostatic testing and disinfection of new water mains. The OWNER will also provide potable water necessary for the disinfection of storage facilities, if required.

1.4 Electrical Energy: The CONTRACTOR shall make all necessary applications and arrangements and pay all fees and charges for electrical energy for power and light necessary for the proper completion of the work during its entire progress. The CONTRACTOR shall provide and pay for all temporary wiring, switches, connections, and meters.There shall be sufficient electric lighting so that all work may be done in a workmanlike manner when there is not sufficient daylight.

1.5 Sanitary Facilities: The CONTRACTOR shall provide adequate sanitary conveniences for the use of those employed on the work. Such conveniences shall be made available when the first employees arrive on the work, shall be property secluded from public observation, and shall be constructed and maintained in suitable numbers and at such points and in such manner as may be required or approved. The CONTRACTOR shall maintain the sanitary facilities in a satisfactory and sanitary condition at all times and shall enforce their use. He shall rigorously prohibit the committing of nuisances on the site of the work on the land of the OWNER, or on adjacent property.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

PART 4 - MEASUREMENT AND PAYMENT (NOT USED)

- END OF SECTION -

SECTION 03560

MAINTENANCE OF WORK SITE

PART 1 - GENERAL

1.1 Scope: This Section covers the general overall maintenance of all Task Order sites to assure the safety and protection of the CONTRACTOR'S employees, general public, materials incorporated into the project, and property within the project limits of any Task Order.

1.2 Safety and Protection:

A. CONTRACTOR shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the work. He shall take all necessary precautions for the safety of employees and the public, and shall provide the necessary protection to prevent damage, injury or loss to:

1. All employees involved with the work and other persons who may be affected thereby.

2. All the work and all materials or equipment to be incorporated therein, whether in storage on or off the site.

3. Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

4. Existing site piping, structures, electrical services, water, and other underground utilities and/or properties.

B. The CONTRACTOR shall notify owners of adjacent utilities when prosecution of the work may affect them. All damage, injury or loss to any property referred to in Paragraphs 1.2.A.3 and 1.2.A.4 above, directly or indirectly, in whole or in part, by CONTRACTOR, any part, to the fault or negligence of CONTRACTOR, shall be replaced or restored to at least original condition at CONTRACTOR'S expense. CONTRACTOR'S duties and responsibilities for the safety and protection of the work shall continue until such time as all the work is completed and ENGINEER has issued a notice to OWNER and CONTRACTOR as described herein that work is acceptable.

C. The CONTRACTOR shall not load or permit any part of any structure to be loaded with a weight that would endanger its safety.

D. The CONTRACTOR shall provide protection of the work from freezing and from other elements which would be harmful to it. The CONTRACTOR shall furnish heat or protective shelters or temporary buildings as required for the prosecution and protection of the work.

E. The CONTRACTOR shall take all necessary precautions for the safety of employees on the work and shall comply with all applicable provisions of Federal, State and local safety laws and building codes to prevent accidents or injury to persons on, about or adjacent to the premises where the work is being performed. He shall erect and properly maintain at all times, as required by the conditions and progress of the work, all necessary safeguards and barricades for the protection of employees on the work and the safety of others employed near the work and public, and shall post danger signs and warning lights warning against the hazards created by such features of the construction as protruding nails, hoists, excavations, elevator hatchways, scaffoldings, window openings, stairways and falling materials.

F. The CONTRACTOR shall designate a responsible member of its organization on the work whose duty shall be the prevention of accidents.

G. The CONTRACTOR shall immediately report in writing, giving full details, to the OWNER all serious accidents which arise out of or in connection with the performance of the work, whether on or adjacent to the site, which cause death, serious personal injury or substantial property damage is caused, the accident shall be reported immediately by telephone or messenger to the ENGINEER. If a claim is made or suit is filed by anyone against the CONTRACTOR or any Sub-Contractor on account of any accident, the CONTRACTOR shall promptly report the facts in writing to the ENGINEER, with a copy to the OWNER, giving full details of the claim.

H. The CONTRACTOR shall assume all risks of loss damage of any kind to any vehicles, machinery, equipment, materials or supplies which he shall provide in doing the work.

I. The CONTRACTOR shall take all precautions to prevent damage to the work by the elements, storm or by water entering the site of the work directly or through the ground. In case of damage by the elements, storm or water, the CONTRACTOR shall make such repairs or replacements or rebuild such parts of the work as the ENGINEER may require in order that the work may be completed as required.

J. The CONTRACTOR shall post illuminated warning and danger signs so as to alert all persons against any hazards created by the work being done under this contract.

K. The CONTRACTOR shall maintain drainage which may be interrupted by his work and shall provide pumping if necessary to route drainage water around the work.

L. The CONTRACTOR shall schedule and conduct a safety meeting at least once per week. Mandatory attendance is required of the Project Superintendent.

1.3 Protection of Public: The CONTRACTOR shall conduct his work so as to interfere as little as possible with the private personal activities of residents, private business and public business and travel. Wherever necessary or required, and at his own expense, he shall maintain fences, furnish full-time or part-time watchmen, guards, flagman and or like protective personnel, maintain lights, and take such actions, precautions as may be necessary to protect life and property.

1.4 Nuisance and Dust Control: During the course of the work the CONTRACTOR shall take steps at his cost as necessary to prevent public nuisance on demand of the ENGINEER by holding down the raising of dust or spraying of mud from construction operation, vehicular traffic, wind or other causes.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

PART 4 - MEASUREMENT AND PAYMENT (NOT USED)

- END OF SECTION -

SECTION 03700

TASK ORDER CLOSEOUT

PART 1 - GENERAL

1.1 Scope: This Section covers requirements for closeout of work for Task Orders.

1.2 Requirements: The CONTRACTOR shall comply with the requirements stated in the General Conditions of these Specifications for administrative procedures in closing out the Work.

1.3 Completion:

A. When the CONTRACTOR considers the Work authorized under a single or multiple Task Order(s) as complete, he shall submit to the ENGINEER a written notice that the Work or designated portion thereof is Complete.

B. Within five (5) working days after receipt of such notice, the ENGINEER will make an inspection to determine the status of completion. The ENGINEER will prepare a punch list that will include a cost estimate for each particular item of work based upon mobilization, labor, materials, and equipment costs as required by Louisiana R.S. 38:2248.B. The dollar amounts so established for uncompleted or unsatisfactory minor work shall be withheld by the OWNER, exclusive of five (5%) percent retainage, until the work is satisfactorily completed. Listed items shall be paid for upon expiration of the global 45 day lien period that will be issued within the initial one (1) year contract time for a single or multiple Tank Order(s) issued therein. The ENGINEER'S opinion as to the status of completion shall be based on completion of the work (Task Order) as specified herein.

C. Should the ENGINEER determine that the Work is not complete:

1. The ENGINEER will promptly notify the CONTRACTOR in writing, giving the reasons therefore in accordance with the General and Supplemental Conditions.

2. CONTRACTOR shall remedy the deficiencies in the Work, and send a second written notice of completion to the ENGINEER.

3. The ENGINEER will reinspect the Work.

D. When the ENGINEER finds that the Work is complete, he will:

1. Prepare and deliver to OWNER a tentative Beneficial Use document.

2. After consideration of any objections made by the OWNER as provided in the General and Supplemental Conditions of the Contract, and when the OWNER considers the work complete (Final complete), the OWNER will execute and deliver to the ENGINEER and the CONTRACTOR a Beneficial Use document with the list of items to be completed or corrected.

1.4 Final Inspection:

A. When CONTRACTOR considers the Work is substantially complete, he shall submit in writing notification that:

1. Contract Documents have been reviewed.

2. Work has been inspected for compliance with Contract Documents.

3. Work has been completed in accordance with Contract Documents.

4. Equipment and systems have been tested in the presence of the ENGINEER and OWNER'S representative and are operational.

5. Work is completed and ready for final inspection.

B. The ENGINEER will make an inspection to verify the status of completion within five (5) working days after receipt of such notification.

C. Should the ENGINEER consider that the Work is incomplete or defective:

1. The ENGINEER will promptly notify the CONTRACTOR in writing, listing the incomplete or defective work.

2. CONTRACTOR shall take immediate steps to remedy the stated deficiencies, and send a second written notification to the ENGINEER that the Work is complete.

3. The ENGINEER will reinspect the Work.

D. When the ENGINEER finds that the Work is acceptable under the Contract Documents, he shall request the CONTRACTOR to make closeout submittals and submittal of the final pay application less five (5%) percent retainage.

1.5 Reinspection Fees: Should the ENGINEER perform reinspections due to failure of the Work to comply with the claims of status of completion made by the CONTRACTOR:

A. OWNER will compensate the ENGINEER for such additional services.

B. OWNER will deduct the amount of such compensation from the final payment to the CONTRACTOR.

1.6 Contractor's Closeout Submittals To Engineer:

A. Evidence of compliance with requirements of governing authorities.

1.7 Final Adjustment of Accounts:

A. Submit a final statement of accounting to the ENGINEER.

B. Statement shall reflect all adjustments to the dollar value of the Task Order.

1. The original value of the Task Order.

2. Additions and deductions resulting from:

a. Task Order(s) Amendment.

b. Changes in quantities as actually installed.

c. Deductions for uncorrected Work.

d. Deductions for liquidated damages.

e. Deductions for reinspection payments.

f. Other adjustments.

3. Total Task Order, as adjusted.

4. Previous payments.

5. Sum remaining due.

1.8 Contract Clear Lien Certificate and Payment of Retainage:

A. Upon the OWNER'S global acceptance (Final Complete) of the Task Order(s), the ENGINEER shall make a global filing with the Parish Clerk of Court and Ex-Officio Record of Mortgages Office (Clerk) as required by Louisiana State Public Contract Statute of all of the completed and accepted Task Order(s) along with the global Beneficial Use document for all Task Order(s) completed within the prior 12 month period. The filing of such shall include all Task Orders issued within the initial one (1) year Contract.

B. In accordance with the Louisiana State Public Contract Statute, the Clerk shall issue to the CONTRACTOR a Clear Lien and Privilege Certificate those Task Order(s) as recorded and for which the global Beneficial Use document was also recorded. Task Order(s) upon expiration of a period of not less that forty-five (45) days, provided no liens are recorded against the subject Task Order(s).

C. Upon receipt of the Clear Lien and Privilege Certificate, the CONTRACTOR shall submit an Application for Payment to the ENGINEER requesting the release of the Project retainage with the certificate attached as evidence of authority for the OWNER to pay the retainage.

D. The ENGINEER shall review the Application for Payment of the Project retainage and if in order shall transmit the application to the OWNER for payment.

E. In accordance with the General Conditions, the OWNER shall release, the project retainage and make payment to the CONTRACTOR the legal sum of the retainage for which the CONTRACTOR is entitled.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

PART 4 – MEASUREMENT AND PAYMENT (NOT USED)

- END OF SECTION -

SECTION 03710

CLEANING

PART 1 - GENERAL

1.1 Scope: This Section covers work site cleaning which shall include daily "policing" of the work and surrounding areas to remove undesirable debris and other objectionable material along with the final cleanup of site required for project acceptance.

1.2 Disposal Requirements: Conduct cleaning and disposal operations to comply with codes, ordinances, regulations and anti-pollution laws.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 General:

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

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

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

3.2 Final Cleaning:

A. Employ skilled workmen for final cleaning.

B. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed interior and exterior surfaces.

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

D. Prior to final completion, CONTRACTOR shall conduct an inspection of sight-exposed interior and exterior surfaces and all work areas to verify that the entire Work is clean.

PART 4 - MEASUREMENT AND PAYMENT (NOT USED)

- END OF SECTION -

SECTION 03750

TRENCH SAFETY SYSTEM

PART 1 – GENERAL

1.1 Scope: This Section covers the requirements for construction safety related to excavations for trenches and / or excavations for structures or any other related excavations required for the completion of this project including all work, labor, materials, tools, equipment and incidentals required as specified herein, with all cost being the responsibility of the CONTRACTOR.

1.2 Definitions:

A. The trench safety system requirements will apply to larger open excavations if the erection of structures or other installations limits the space between the excavation slope and this installation to dimensions equivalent of a trench as defined.

B. A trench shall be defined as a typically narrow excavation (in relation to its depth) made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 20 feet.

C. Trench Safety Systems include but are not limited to sloping, sheeting, trench boxes or trench shields, sheet piling, cribbing, bracing, shoring, dewatering or diversion of water to provide adequate drainage.

1.3 Regulatory Requirements: Install and maintain trench safety systems in accordance with the detail specifications set forth in the provision of Excavations, Trenching, and Shoring, Federal Occupation Safety and Health Administration (OSHA) Standards, 29 CFR, Part 1926, Subpart P, as amended. The Sections that are incorporated into these specifications by reference include Sections 1926 650 through 1926 652.

1.4 Miscellaneous:

A. Install and maintain trench safety systems in accordance with provisions of OSHA 29 CFR.

B. A licensed professional ENGINEER registered in Louisiana, as identified in the CONTRACTOR's Trench Safety Program, shall verify that trench boxes and other pre manufactured systems are certified for the actual installation conditions.

C. CONTRACTOR or CONTRACTOR's independently retained consultant, shall make daily inspections of the trench safety systems to ensure that the installed systems and operations meet OSHA 29 CFR and other personnel protection regulations requirements.

D. If evidence of possible cave in's or slides is apparent, CONTRACTOR shall immediately stop work in the trench and move personnel to safe locations until the necessary precautions have been taken by CONTRACTOR to safeguard personnel entering the trench.

E. Maintain a permanent record of daily inspections.

F. CONTRACTOR shall verify specific applicability of the selected or specially designed trench safety systems to each field condition encountered on the project.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

PART 4 - MEASUREMENT AND PAYMENT (NOT USED)

END OF SECTION

SECTION 03800

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 Scope: This Section covers the preparation of an Operation and Maintenance Manual by the CONTRACTOR for equipment provided under this Contract.

1.2 Format:

A. Prepare data in the form of an instructional manual.

B. Binders: Commercial quality, 8½ x 11, three-ring binders with hardback, cleanable, plastic covers; four (4") inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

C. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; list title of Project; identify subject matter of contents.

D. Arrange content by section numbers and sequence of Table of Contents of this Project Manual.

E. Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

F. Text: Manufacturer's printed data, or typewritten data.

G. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

1.3 Contents:

A. Table of Contents: Provide title of Project; names, addresses, and telephone number of ENGINEER and CONTRACTOR with name of responsible parties; schedule of products and systems, indexed to content of the volume.

B. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

C. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

D. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems.

E. Type Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

1.4 Submittals:

A. Submit one (1) copy of completed volumes in final form fifteen (15) days prior to final inspection. Copy will be returned after final inspection with ENGINEER comments. Revise content of documents as required prior to final submittal.

B. Submit four (4) copies of revised volumes of data in final form within ten (10) days after final inspection.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

- END OF SECTION -

CITY OF ALEXANDRIA, LOUISIANA

ANNUAL REQUIREMENTS CONTRACT
FOR
WATER, WASTEWATER, NATURAL GAS AND
GENERAL (SITE RELATED) SYSTEMS
2026

PART 4 – WATER

Section 04120 - WATER DISTRIBUTION SYSTEM AND RELATED APPURTENANCES

SECTION 04120

WATER DISTRIBUTION SYSTEM AND RELATED APPURTENANCES

PART 1 - GENERAL

1.1 Scope: This Section covers the installation replacement, repair, etc. of water mains and related water works appurtenances as indicated on the Task Order and as specified herein.

1.2 Product Delivery, Storage and Handling:

A. Inspection of Material at Delivery Point:

1. When delivered to the site, and prior to unloading, the CONTRACTOR shall inspect all pipe, valves, valve boxes and meters, and accessories for loss, damage or lack of specified identification and markings.

2. Any defective or improper material shall be immediately marked and shall not be unloaded. Defective or improper material shall not be considered for payment as "material stored on or at the site".

B. Handling: In shipping, storing and installing pipe, valves and accessories shall be kept in a sound, undamaged condition. They shall, at all time, be handled with care and shall not be dropped, dumped or bumped against any other object. Any material(s) damaged shall be marked and immediately removed from the job site.

C. Storing:

1. Pipe shall be stored off the ground on sticking or pallets. Pipe shall be stacked with spigot ends projecting from the stack in opposite directions for alternate rows.

2. Valves, meter boxes, couplings, fittings, etc. shall be kept clean and dry.

D. Defective Materials: All materials found at any time during the progress of the work to have cracks, flaws, or other defects will be rejected and marked and the CONTRACTOR shall promptly remove such defective material from the work site.

1.3 Applicable Publications: The publications listed below form a part of this specification to the extent referenced. The publications may be referred to in the text by basic designation only.

A. American Water Works Association:

C104 Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water

C105 Polyethylene Encasement for Ductile-Iron Pipe Systems

C110	Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in. for Water and Other Liquids
C111	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
C150	Thickness Design of Ductile Iron Pipe
C151	Ductile-Iron Pipe, Centrifugally Cast for Water or Other Liquids
C153	Ductile - Iron Compact Fittings, 3 Inch through 24 Inch for Water Service
C502	Dry-Barrell Fire Hydrants
C509	Resilient Seated Gate Valves for Water Supply Service
C515	Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service
C550	Protective Epoxy Interior Coating for Values and Appurtenances
C600	Installation of Gray and Ductile Cast Iron Water Mains and Appurtenances
C900	Polyvinyl Chloride (PVC) Pressure Pipe, 4 Inch through 12 Inch, for Water Distribution
C901	Polyethylene (PE) Pressure Pipe & Tubing, ½ Inch through 3 Inch, for Water Service
C906	Polyethylene (PE) Pressure Pipe and Fittings, 4 Inch through 63 Inch, for Water Distribution

B. American Society for Testing and Materials:

A536 Specifications for Ductile Iron Castings

D1784 Rigid Poly (Vinyl Chloride)(PVC) Compounds and Chlorinated Poly (Vinyl Chloride)(PVC) Compounds

D2240 Test Method for Rubber Property - Durometer Hardness

D2241 Poly (Vinyl Chloride)(PVC) Plastic Pipe (SDR-PR)

D2737 Specifications for Polyethylene (PE) Plastic Tubing

D3035 Specification for OD Controlled Polyethylene (PE) Pipe (DR-PR)

D3139 Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals

1.4 Submittals: Submittals shall be provided in accordance with Section 03340 -Shop Drawings, Samples And Project Data.

1.5 Quality Assurance: All pipe and fittings shall be furnished by manufacturers who are fully experienced, reputable, and qualified in the manufacture of the material to be furnished.

1.6 Requirements for Low Lead in Water Distribution Systems: The CONTRACTOR shall comply with all applicable provisions of La. R.S. 40:1299.27.1 regarding Low Lead in Water Distribution Systems.

PART 2 - PRODUCTS

2.1 Plastic Water Pipe and Fittings:

A. Plastic Water Pipe (Push-On Joints): Plastic pipe shall be polyvinyl chloride (PVC) conforming to ASTM D1784, ASTM D2241 and/or AWWA C900 as applicable, latest revisions, with integral bell push-on gasketed joint conforming to ASTM D3139. PVC pipe shall have a blue shell. The requirements for the specific type of plastic pipe to be used under this project shall be as given below unless otherwise noted on the Drawings.

4" thru 12" - PVC - DR 18 (DIPS O.D./AWWA C-900)
3" and below – PVC – DR 21 (IPS O.D./ASTM D2241)

The pipe shall have an integral bell, rubber gasket joint and shall be capable of direct tapping. The PVC pipe shall be approved by the National Sanitation Foundation for potable water pipe and said stamp be inclusive on the pipe furnished along with the nominal size O.D., pressure class, dimensional ratio, and the manufacturer's name or trademark which shall be Certainteed Corporation, H&W Industries, Inc., Extrusion Technologies, Inc., or equal.

B. Plastic Water Pipe (Push-On Internally Restrained Joints): Plastic pipe shall be polyvinyl chloride (PVC) conforming to ASTM D1784 and/or AWWA C900 as applicable, latest revisions, with integral bell push-on internally restrained joints conforming to ASTM D3139. PVC pipe shall have a blue shell. The requirements for the specific type of plastic pipe to be used under this project shall be as given below unless otherwise noted on the Drawings.

4" thru 12" – PVC – DR 18 (DIPS O.D./AWWA C-900)

The pipe shall have an integral bell, rubber gasket internally restrained joint and shall be capable of direct tapping. The PVC pipe shall be approved by the National Sanitation Foundation for potable water pipe and said stamp be inclusive on the pipe furnished along with the nominal size O.D., pressure class, dimensional ratio, and the manufacturer's name or trademark which shall be Eagle Loc 900 as manufactured by J.M. Eagle, Cetra-Lok C900 RJIB as manufactured by North American Specialty Products, or equal.

C. Polyethylene Water Pipe (Restrained Joints By Butt Fusion or Electro-Weld): Polyethylene Water Pipe shall be PE 4710, 3500 psi Design Stress, with a potable Water Service Certification in accordance with NSF No. 14. Polyethylene pipe shall have a blue shell or longitudinal blue stripes. The requirements for the specific type of butt fused or electro-weld polyethylene pipe to be used under this Contract shall be as given below unless otherwise noted on the Drawings.

1. ¾", 1", 1- ½" Polyethylene Plastic Pipe (PE): Shall be PE 4710 (CTS), SDR 9 conforming to ASTM D2737 and approved by the National Sanitation Foundation for potable water use and meet AWWA C901 specifications. The PE tubing shall be rated for use with water at 73.4° F at a maximum working pressure of 200 psi. The PE water service tubing shall be Driscopipe 5100 – Ultra Line manufactured by Phillips Driscopipe, Inc., or "Plexco Bluestripe" as manufactured by Chevron Chemical Company or approved equal.

2. 2" thru 3" Polyethylene Plastic Pipe (PE): Shall be PE 4710, (IPS), SDR 11 conforming to ASTM D2737 and approved by the National Sanitation Foundation for potable water use and meet AWWA C901 specifications.

3. 4" thru 36" Polyethylene Plastic Pipe (PE): Shall be PE 4710, (DPS), SDR 11 conforming to ASTM D3350 and approved by the National Sanitation Foundation for potable water use and meet AWWA C906 specifications.

D. Fittings for PVC Pipe: Fittings that are three (3) inches in diameter or larger shall be mechanical joint S.S.B., unless otherwise shown on the Drawings, and shall be made of ductile cast iron with a pressure rating of 350 psi, and cement lined and asphalt coated. All fittings shall meet or exceed ANSI/AWWA C153/A21.53 and ANSI/AWWA C111/A21.11 specifications and shall be manufactured by Tyler Pipe, Union Foundry or approved equal. All follower glands shall be mechanical joint restraint devices as specified under "Mechanical Joint Restraint Devices" of these Specifications. Fittings two (2) inches and smaller, unless otherwise shown on the Drawings, shall be PVC (DR 21) gasketed fittings manufactured by the Harrington Corporation of Lychburg, Virginia, Spears Manufacturing Company of Sylmar, California, or approved equal. Ductile cast iron fittings shall be wrapped in polyethylene wrap as specified herein.

E. Bolts and Nuts for Mechanical Joint Fittings: Bolts and nuts for mechanical joints shall consist of cor-ten steel.

2.2 Polyethylene - PE Service Tubing: Water service tubing shall be C.T.S., PE 4710, DR 9 conforming to ASTM D2737 and approved by the National Sanitation Foundation for potable water use and meet AWWA C901 specifications. The PE tubing shall be rated for use with water at 73.4°F at a maximum working pressure of 200 psi. All PE connections shall be reinforced with insert stiffeners.

2.3 Ductile Cast Iron Pipe (Underground):

A. Ductile Cast Iron Pipe: Ductile cast iron (D.I.) pipe used underground shall be designed in accordance with ANSI/AWWA C151/A21.51 and ANSI/AWWA

C111/A21.11 specifications and have mechanical joints unless otherwise shown on the Drawings. Mill certificates shall be furnished upon request of the ENGINEER. The requirements for the specific type of ductile iron pipe to be used under this project shall be as given below unless otherwise noted on the Drawings.

4" thru 12" - Ductile Iron – Cl.51 Pressure Class 350

B. Coating and Lining: The pipe shall be cement lined on the inside according to AWWA C104 and seal coated outside with a one (1) mil thick asphaltic coating in accordance with AWWA C151. Underground ductile iron pipe and fittings shall be wrapped in polyethylene wrap as specified herein.

C. Fittings: Refer to paragraph 2.1.D. of this Section.

D. Bolts and Nuts for Mechanical Joint Fittings: Refer to paragraph 2.1.E. of this Section.

2.4 Polyethylene Wrap: Polyethylene wrap shall conform to AWWA C105 specifications. Film shall be Class "C" - Black, with a minimum nominal thickness of .008 inches (8 mils). Tape for securing the film shall be thermoplastic material with a pressure sensitive adhesive face capable of bonding to metal, bituminous coating and polyethylene. Tape shall have a minimum thickness of 8 mils, and a minimum width of one inch. The polyethylene film envelope shall be free as is commercially possible of gels, streaks, pinholes, particles of foreign matter, and undispersed raw materials. There shall be no other visible defect such as holes, tears, blisters, or thinning out at folds. Manufacturers shall furnish a certification of conformance of the material to the requirement of AWWA C105 or ANSI A21.5.

2.5 Non-Corrosive Metallic Wire: Non-corrosive metallic wire installed over polyethylene and PVC pipe for detection purposes shall be copper wire, Type TW, A.W.G. #10 gauge solid. Wire splices shall be made using a direct bury splice kit.

2.6 Wire Splice Kits: Wire splices shall be Direct Bury Splice Kit, Part No. 054007-09964 as manufactured by 3M Electrical Products Division of Austin, Texas 78769-2963 or approved equal.

2.7 Valves and Valve Boxes (Underground):

A. Gate valves shall be resilient seated wedge type and shall be iron body, non-rising stem with "O" ring stem seals, open left with two inch (2") square operating nut and with mechanical joint ends. All gate valves shall comply with the latest revision of the AWWA Gate Valve Standard C-509 or C-515 for resilient seated wedge type gate valves with N.S.F. approved fusion bonded epoxy coating conforming to AWWA C-550. Gate valves shall be rated for 250 psi working pressure and shall be hydrostatically tested to 500 psi for structural integrity. The gate valves shall be covered by a manufacturer's published 10 year warranty. All gate valves shall be UL listed and FM approved.

B. Valve boxes shall be three (3) piece adjustable, five and one-quarter (5¼") inch shaft diameter, high grade screw-type cast iron valve boxes as manufactured by the Tyler Corporation of Tyler, Texas, Series 6850 or approved equal. The cast iron valve box shall have a base large enough to fit completely over the valve bonnet and shall have the word "Water" embossed on the top side of its cover.

C. Iron bodied gate valves and valve boxes shall be wrapped in polyethylene wrap as specified herein.

D. Valve boxes shall be installed upon the valve with the use of a valve box stabilizer. The valve box stabilizer shall be Valve Box Adapter II as manufactured by Adapter, Inc. or approved equal.

2.8 Tapping Sleeves and Valves and Valve Boxes:

A. Tapping sleeves for 12" and smaller water mains shall be of steel with epoxy coating and stainless steel bolts, style FTS, as manufactured by Ford or an approved equal, mechanical joint end connections, 200 psi maximum working pressure, designed to meet or exceed AWWA Standards. Sleeve section shall be sized for the pipe on which it is to be mounted as verified by the CONTRACTOR. The outlet or branch shall be flanged for acceptance of the companion-tapping valve. Gaskets shall be plain end for use on cast iron or PVC mains.

B. Tapping sleeves for 14" and larger water mains shall be a listed above or may be constructed of Grade 18-8 Type 304 Stainless Steel and be of the split sleeve design style FTSS, as manufactured by Ford or an approved equal. Sleeves shall be provided with a gridded gasket, which totally surrounds the pipe to be tapped. The gasket shall be composed of virgin GPR conforming the ASTM D2000-80M 4AA607. The sleeves shall be manufactured to withstand a maximum working pressure of 150 psi. The outlet or branch shall be constructed of stainless steel and be flanged in accordance with AWWA 207 Cass D, ANSI 150 psi drilling.

C. Tapping valves shall conform to the manufacturer requirements above and shall have ANSI 150 psi flange or inlet and mechanical joint at outlet.

D. Valve boxes for tapping valves shall be equal to valve boxes described in Paragraph 2.7.

2.9 Service Transfer/Assembly (1"):

A. The 1" Service Transfer/Assembly shall include the line field tap with saddle and corporation stop on the newly installed and accepted water line, meter, meter box and cover, coupling for connection to the existing service line, and completing the transfer of service from the old system to the new system.

B. The tapping saddle shall be a hinged brass saddle with 1" CC tap.

C. The corporation stop shall be an AWWA CC taper thread 1" inlet, 1" ball valve and 1" CTS pack joint outlet for PE tubing. (300 psi working pressure)

D. The meter inlet valve shall be 1" CTS pack joint inlet for PE tubing, 1" ball valve with locking wings, and ¾" meter swivel nut.

E. The meter box and cover shall be constructed of engineered plastic with nominal dimensions of 17" long, 12" wide, and 12" tall. The meter box cover shall have a hinged reading door.

F. The meter shall be a bronze Badger E-Series Electronic NSF and ANSI certified lead free. Meters to be provided with the ITRON 100W End Point and End Point Connector. Water measurement reading shall be in Cubic Feet.

G. The bolted coupling shall be epoxy coated steel, NSF approved, compression type, two bolt design.

H. The following material shall be used for 1" Service Transfer/Assembly:

Item	Manufacturer	Catalog No.
Tapping Saddle	Ford	S90
	Mueller	S-13000
Corporation Stop	Ford	FB-1000-4
	Mueller	P-25008
Inlet Valve	Ford	B43-342W
	Mueller	P-24350-3
Bolted Coupling	Dresser	Style 38
	Smith-Blair	Style 411

2.10 Leak Detection Meter Setting: The leak detection meter setting shall include two (2) line field taps with saddles and corporation stops on the newly installed and accepted or existing water line, meter inlet valve, meter and plastic meter box and lid. All components of the leak detection meter setting shall meet the latest NSF standards. Refer to Paragraph 2.9 "Service Transfer/Assembly (1") of this Section.

2.11 Fire Hydrant Assembly (Type II):

A. Fire hydrants shall be Model T-129 manufactured by M & H, or approved equal and conform to AWWA Standard C-502 and be equipped with two (2) nozzles, and one (1) pumper nozzle. The two (2) – 2 ½" hose connection nozzles shall be 3 5/64" O.D. with eight (8) threads per inch. The one (1) – 4 ½" pumper nozzle shall be 5 31/64" O.D. with four (4) threads per inch. The fire hydrant shall be 5 ¼" main valve opening with 6" mechanical joint inlet, and shall have ductile iron upper and lower barrels and elbows. Hydrants shall be factory painted. CONTRACTOR shall verify and be responsible for matching the hose connections and pumper nozzle threads to the thread standard used by the City of Alexandria Fire Department. All components, barrel, valve stem, etc., shall be designed to "break away" at a point above ground level in the event of traffic contact. CONTRACTOR SHALL INSTALL FIRE HYDRANT SO THAT THE BURY LINE ON THE FIRE HYDRANT IS AT THE FINISHED GROUND ELEVATION.

B. Hydrant extensions, to adjust for varying depths of cover, shall be provided by the hydrant manufacturer and include barrel extensions, stainless steel stem couplings, clevis pins, cotter pins, gaskets, o-rings, bolts, nuts, etc. Hydrant extension lengths shall be as required to accurately place the breakaway flange a distance of 3" above the finished ground level.

C. Swivel tees, swivel by solid adapter fire hydrant leads, and swivel by swivel 90° elbows shall be as manufactured by Tyler Pipe or approved equal. Swivel by solid adapter fire hydrant leads shall be at the required length to place the centerline of the hydrant within 12" of the right-of-way line.

2.12 Water Sampling Station:

A. Sampling stations shall include the line field tap with corporation stop on the newly installed water main, curb stop, curb box, sampling station, and associated brass piping and fittings.

B. The line field tap shall be made using Ford S90 tapping saddle, Ford 3/4" x 3/4" (F1000-3) corporation stop with pack joint couplings, or approved equal for connection to P.E. tubing. The line tap will include all adaptors and insert stiffeners required to connect P.E. tubing to the new corporation stop. Curb stop shall be 3/4" x 3/4" x 3/4" Ford B41-333 with Ford curb box and stationary rod, or approved equal. Brass piping and fittings shall connect the curb stop to the sampling station.

C. The sampling station shall be a minimum three (3) foot bury with 3/4" F.I.P. inlet and a 7/16" unthreaded blow off and sampling bibb. All stations shall be enclosed in a lockable, nonremovable aluminum housing with hinged opening. When open the station shall require no key for operation, and water will flow in a all stainless steel waterway. All working parts shall be stainless steel and serviceable from above ground with no digging or replacement needed. A stainless steel pet cock will be located below the sampling bibb to allow pumping of water remaining inside the station to insure non-freezing. One (1) evacuation pump kit shall be furnished with every station. Sample taps for sampling stations shall be of the smooth nozzle type and shall be turned downward. The sampling station shall be the Kupferle Foundry Company, Eclipse No. 88-SS sampling station or approved equal.

D. Stone bedding installed beneath the sampling station shall be as specified in Section 07220 - Traffic Maintenance Aggregate.

2.13 PE To M.J. Adapters: Polyethylene mechanical joint adapters shall be ductile iron pipe size DR 11 as manufactured by Independent Pipe Products or approved equal.

2.14 Backfill Material for Valves and Valve Boxes: Select material in conformance with paragraph 2.1, Section 07130 – Select Fill Material.

2.15 Concrete Valve Box Pads: Refer to Section 07330 - Cast-In-Place Concrete.

2.16 Concrete for Thrust Blocking: Concrete required for thrust blocking shall be in conformance with Section 07330 - Cast-In-Place Concrete.

2.17 Cutting-In Sleeves: Cutting-in sleeves shall be used to connect MJ bell ends to plain end pipe. Cutting-in sleeves shall be constructed of ASTM A536 ductile iron. The gasket shall be composed of ASTM D2240 styrene butadiene rubber. The sleeves shall be manufactured to withstand a maximum working pressure of 150 psi. The outlet shall be designed to accommodate a standard mechanical joint fitting.

2.18 Joint Restraints for PVC Pipe: The restraint devices for PVC push on pipe joints shall be certified by the manufacturer to restrain the test and working pressures. Restraint devices for PVC pipe joints shall be EBAA Iron, Inc. Series 1600 Ductile Iron Retainers for C-900 pipe and Series 6500 Ductile Iron Retainers for IPS O.D. PVC pipe or approved equal.

2.19 Mechanical Joint Restraint Devices: Mechanical joint restraint devices shall include a restraining mechanism which, when actuated, imparts multiple wedging action against the pipe, increasing its resistance as the pressure increases. Flexibility of the joint shall be maintained after burial. Glands shall be manufactured of ductile iron conforming to ASTM A 536-80. Restraining devices shall be of ductile iron heat treated to a minimum hardness of 370 BHN. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell and tee-head bolts conforming to ANSI/AWWA A21.11 and ANSI/AWWA C153/A21.53 of latest revision. Twist-off nuts shall be used to insure proper actuating of the restraining devices. The mechanical joint restraint device shall have a working pressure of at least 250 psi with a minimum safety factor of 2:1 and shall be EBAA Iron, Inc., MEGALUG or approved equal.

2.20 Tie Lugs: Tie lugs shall be used for the restraint of mechanical joints. Tie lugs shall be installed between the mechanical joint bell and follower gland. Tie lugs shall be cast from ductile iron with a tensile strength of 80,000 psi and a yield strength of 60,000 psi. Tie lugs shall be used to anchor all thread rods which shall, in turn, extend laterally to span across the mechanical joints to be restrained.

2.21 All Thread Rods: Threaded rods shall be low carbon steel, electro-galvanized zinc plated and have a minimum diameter of 3/4".

2.22 Pipeline Markers: Blue Carsonite Utility Marker - 375 (66" long) with CW-112 or CW-116 and P101 (Custom) decals as distributed by Jim Cox Sales (1-800-838-7377). The P-101 decal shall have the following information inscribed on its face: "CITY OF ALEXANDRIA" 1-318-473-1264".

2.23 Caps and Plugs:

A. Where existing lines are to be abandoned, the ends shall be cut and fitted with an appropriately sized cap or plug. The cap or plug material may be PVC. The capped end shall be backfilled with compacted native material in such a manner as to ensure the integrity of the cap.

B. Where lines are to remain in service, the ends shall be cut and fitted with a ductile iron mechanical joint coupling with a ductile iron plug or with a ductile iron mechanical joint cap. This assembly shall be blocked with concrete thrust blocking.

2.24 "Foster" Adapter: "Foster" Adapters shall be designed to connect mechanical joints to mechanical joints. "Foster" Adapters shall be constructed of ASTM A536 ductile iron. The gasket shall be composed of ASTM D2240 styrene butadiene rubber.

2.25 Compression Couplings: Compression couplings for four inch (4") size pipe and up shall be ductile iron mechanical joint sleeves manufactured in accordance with ANSI/AWWA C110/A21.10 and ANSI/AWWA. Compression couplings for two inch (2") and smaller pipe shall be stainless steel or brass compression couplings manufactured by Rockwell or approved equal.

PART 3 - EXECUTION

3.1 General: All pipe, valves, appurtenances and accessories shall be as specified herein. Any deviations must be approved by the ENGINEER before installation.

3.2 Pipe Bedding Conditions: All pipes and other related items laid in open trench excavations shall be uniformly supported over their full length on beddings of the types specified, if any. Flat-bottomed trenches shall be excavated and dewatered prior to preparing the specified foundations. All work shall be performed in a dry trench. Where pipe bedding conditions of a higher type than called for in the Specifications are ordered as a result of the CONTRACTOR'S method of operation, the CONTRACTOR shall be due no additional compensation. Where such higher types are required or directed by the ENGINEER as a result of unsuitable soil conditions, the CONTRACTOR shall be paid for special bedding under appropriate bid items, or if not included as a bid item, then as negotiated.

3.3 Inspection of Pipe Before Installation: All pipe, fittings and related items shall be carefully inspected in the field before lowering in the trench. Cracked, broken, warped, out of round or otherwise defective pipe, fittings, or other related items, as determined by the CONTRACTOR or the ENGINEER, shall be pulled and not installed. Such rejected pipe shall be clearly tagged in such manner as not to deface or damage it, and the pipe shall then be removed from the job site by the CONTRACTOR at his own expense.

3.4 Installation of Water Pipe and Fittings:

A. All pipe and fittings shall be installed in strict accordance with the manufacturer's recommendations with excavation and backfill in accordance with Section 07150 - Excavation, Backfill and Compaction of Utility Trenches.

B. PVC water main installation shall conform to ANSI/AWWA C605 – Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water and use a Type 2 trench as detailed in that standard.

C. Polyethylene water main installation shall conform to AWWA Manual M55: PE Pipe Design and Installation and use a Type 2 trench as detailed in that standard.

D. Ductile iron water main installation shall conform to ANSI/AWWA C600 – Installation of Ductile Iron Water Mains and their Appurtenances and use a Type 2 trench as detailed in that standard.

E. Trench widths should provide a minimum space of four (4) inches on each side of pipe to avoid excess earth loads on pipe and to allow proper compacting of backfill to provide side wall support. Where excavation is in soil of a select material type, normal trench depth will be used. If soil is of a rocky or clay type, trench will be excavated to a depth of six (6") inches below the pipe and a layer of select material will be provided as bedding for the pipe.

3.5 Pipe Laying: Every precaution shall be taken to prevent foreign material from entering water pipe while it is being placed in the trench. At times when pipe laying is not in progress, the open ends of the pipe shall be closed by a water tight plug or other means approved by the ENGINEER. If water is in the trench, the seal shall remain in place until the trench is pumped enough to resume laying operations. No pipe shall be laid in water or when, in the opinion of the ENGINEER, trench conditions are unsuitable.

3.6 Depth of Cover:

A. The water mains shall be laid so as to have a minimum of three (3) feet of earth cover. For road crossing, the cover in the road shall be a minimum of five (5) feet and at the street ditch shall also be a minimum of three (3) feet. Where required by site conditions, proposed LDOTD permits or proposed railroad permits the CONTRACTOR shall provide for extra depth burial.

B. The CONTRACTOR shall install all water lines as to maintain a minimum horizontal distance of six (6) feet from all sewer lines and minimum vertical distance of eighteen (18) inches from all sewer lines. All distances shall be measured from the outside diameter of each pipe.

3.7 Installation of Polyethylene Wrap: All underground ductile iron pipe, fittings and valves shall be encased with a polyethylene wrap. The wrap shall be installed in accordance with the manufacturer's recommendations and AWWA C-600. The wrap shall be secured to the pipe, fittings, etc. with polyethylene compatible adhesive tape. All rips, tears or other damage shall be repaired with the adhesive tape.

3.8 Installation of Non-Corrosive Metallic Wire: The CONTRACTOR shall install a non-corrosive metallic wire directly over and on the center of all plastic water lines. This wire shall be carried through with the line in locations where short sections of ductile pipe is used. The wire shall be continuous on all mains and service lines and shall be connected to all fixtures and appurtenances. The locator wire shall be attached to the water mains and service lines with duct tape at eight (8) foot intervals. The wire shall be connected to all valves and shall be brought up near all valve boxes and attached to an 18" x 5/8" smooth steel dowel with a metal clamp.

3.9 Installation of Wire Splice Kit: Splice caps as specified shall be installed over wire splices then be folded adjacent to the wire run and wrapped tightly with electrical tape as shown on the Drawings.

3.10 Non-Corrosive Metallic Wire Testing: Upon completion of all pipe installation, the Contractor shall demonstrate that the wire is continuous and unbroken through the entire run of the pipe. Demonstration shall include full signal conductivity (including splices) when energizing for the entire run in the presence of the Owner or Engineer. If the wire is broken, the Contractor shall repair or replace it. Pipeline installation will not be accepted until the wire passes this test.

3.11 Installation of Underground Valves and Valve Boxes:

A. All valves and valve boxes shall be backfilled with select material. (Refer to Section 07130 – Select Fill Material).

B. The valve boxes shall have a concrete pad poured at the top of the box as detailed on the Drawings and painted "safety blue".

3.12 Tapping Lines:

A. Tapping work shall be performed under the direct inspection of the ENGINEER. The ENGINEER shall be notified 24 hours in advance of any planned line tap. Tap coupons shall be labeled and provided to the ENGINEER after each completed tap has been made.

B. The CONTRACTOR shall verify the outer dimension and type of existing lines which are to be tapped for tying the new line to the existing lines prior to ordering connection equipment and fittings. Any deviation shall be brought to the attention of the ENGINEER for resolution.

C. Install tapping sleeve and valve in accordance with the manufacturer's instructions. Before drilling, pressure test the tapping sleeve and valve. Install DIMJ plug in valve prior to testing. Pressure test to 150 psig for thirty minutes. Visually check all connections for leaks.

3.13 Cutting and Capping Lines:

A. Existing water pipe is to be cut in a straight and true face after arranging with the OWNER'S personnel on a timing and sequence of valving-off the section to be cut. The cut ends shall be cleaned for attachment of appropriate fittings. Unless otherwise specified, fittings shall include a ductile iron mechanical joint plug or cap with retainer glands and nipples as required. Concrete blocking shall be installed on all water mains to remain in service. As part of the operation, the CONTRACTOR shall physically remove a length of five (5) feet. Where mechanical joint fittings cannot be used because of job conditions, the CONTRACTOR shall request approval of the ENGINEER for use of alternative type fittings.

B. Included in this item is also the capping of any lines to be abandoned. The sequence of water cut-off operations will determine the type of capping and blocking to be required for the end of pipe to be eventually abandoned. The existing line to be abandoned, however, must have the ends sealed under any sequence of cut-off developed.

3.14 Service Transfer:

A. The service transfer/assembly shall be installed as specified herein.

B. If new meters are to be installed and old meters salvaged, the reading of the pulled meter and the new meter along with meter serial numbers and customer names and addresses shall be forwarded to the City of Alexandria Billing Department.

C. The tap shall be made at 45° to line perpendicular (top of pipes tap will not be accepted).

D. Meter settings, if required, are to be neatly set flush to natural ground and aligned perpendicular to the centerline of the street.

E. All existing service equipment including meters, meter boxes, valves, couplings, etc., shall be delivered to the yard.

3.15 Installation of Leak Detection Meter Setting:

A. The leak detection meter setting shall be installed as specified herein.

B. The taps shall be made at 45° from the top of the pipe (top of pipes tap will not be accepted).

C. Meter settings are to be neatly set flush to natural ground and aligned perpendicular to the centerline of the street. Installation shall be as specified herein.

3.16 Installation of Fire Hydrant Assembly:

A. All fire hydrants will be installed specified herein and/or as otherwise ordered by the ENGINEER. All hydrants will be properly blocked against undisturbed soil with concrete as in AWWA C-600.

B. Hydrants shall be faced toward the principal street and will have ample barrel length for the specified thirty-six (36) inch cover and to provide three (3") inches from bottom flange to finish grade.

C. Hydrants shall be wrapped according to the specifications set forth in "Ductile Cast Iron Pipe and Fittings" of these Specifications with care given not to block hydrant drain down.

D. The inlet shoe connection for the side mounted fire hydrant shall be adjusted at the manufacturer's factory as to provide that the pumper nozzle is straight and located 90° from the lead pipe.

E. Hydrants shall be vertically adjusted as required through the use of barrel extensions to attain proper height.

F. Hydrants shall be horizontally adjusted as required through the use of hydrant lead pipes to attain proper distance from the right-of-way.

G. Prior to request for Final Inspection, all fire hydrants shall be neatly field painted with paint type as recommended by the hydrant manufacturer and color shall be per OWNER's requirements.

3.17 Installation of Water Sampling Station:

A. The line field tap shall be closely coordinated with the OWNER and carried out under the ENGINEER's observation.

B. Water service tubing or PVC pipe will be paid separately at respective unit prices bid and are not considered segments of the sampling station.

C. The sampling station shall be as specified herein.

D. The field tap shall be made at 45° to line perpendicular (top of pipe taps will not be accepted).

E. Sampling station shall be installed with the support/locking post set into compacted trench backfill a minimum of three feet (3') and cast aluminum base flush to natural grade.

3.18 Installation of Concrete Thrust Blocking: Concrete thrust blocking on water mains shall be provided at all tees, bends, dead ends, valves and other such appurtenances.

3.19 Connection to Existing Lines:

A. Connection to existing lines shall be performed under the direct inspection of the ENGINEER. The ENGINEER shall be notified 24 hours in advance of any planned line connection.

B. Verify the outer dimension and type of existing lines which are to be connected for tying the new line to the existing lines prior to ordering connection equipment and fittings. Any deviation shall be brought to the attention of the ENGINEER for resolution.

3.20 Field Hydrostatic and Leakage Tests:

A. The hydrostatic testing of all lines shall conform to the requirements of AWWA C-600, and/or AWWA C-605, except as modified as follows:

1. Maximum allowable leakage shall not exceed ten (10) gallons per inch of pipe diameter per mile of pipe per 24 hours.

2. The test shall be applied to the whole or individual valved off sections of the mains after the trench is backfilled.

3. Furnish gauges, water meter, water and all other material, tools, labor, equipment and other necessary assistance of conducting the tests. The ENGINEER will be notified at least 48 hours in advance of the hydrostatic test. The ENGINEER will be present at any or all tests.

4. The test pressure shall be 150 psi and shall be maintained for a minimum of four (4) hours. The test pressure will be based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge.

B. Should the amount of leakage exceed that specified, locate and repair the defective joints until the leakage is within the specified limits.

3.21 Disinfection Test, Sampling Tap, and Temporary Line Flushing Assembly (Chlorination):

A. General:

1. The disinfection of water mains and appurtenances shall conform to the requirements of AWWA C-651- Disinfecting Water Mains, except as modified herein.

2. The OWNER shall collect the bacteriological samples. The CONTRACTOR shall assist in the collection of samples from the completed system by providing acceptable sampling taps and temporary line flushing assemblies, as required, and suitable for satisfactory chlorination and flushing of the new line.

3. Temporary line flushing assemblies shall be adequately sized to allow flushing of the main at a velocity of no less than 3 feet per second.

4. Upon receipt of notice of an acceptable bacteriological test from the State Department of Health and Hospitals, the CONTRACTOR shall remove the chlorine sampling taps and temporary line flushing assemblies.

5. The CONTRACTOR will be responsible for the successful disinfection of all water mains. The CONTRACTOR shall assure that water shall not be furnished for consumer's use until water samples collected by the OWNER and analyzed by the State Department of Health and Hospitals show the water to be free of coliform bacteria.

B. Disinfection Procedures: Disinfection shall be accomplished in conformance with the following:

1. Preliminary Flushing: The main shall be flushed, prior to chlorination, as thoroughly as possible with the water pressure and outlets available. Flushing shall be done after the pressure test has been made. It must be understood that flushing removes only lighter solids and cannot be relied upon to remove heavy material allowed to get into the main during laying. If no hydrant is installed at the end of the main, a tap should be provided large enough to develop a velocity in the main of at least 3 fps.

2. Form of Applied Chlorine: Any of the following methods of procedure (arranged in order of preference) shall be followed, subject to the approval of the ENGINEER:

a. Liquid chlorine gas-water mixture
b. Direct chlorine feed
c. Calcium or sodium hypochlorite and water mixture

3. Liquid Chlorine: A chlorine mixture shall be applied by means of a solution-feed chlorinating device in combination with a booster pump for injecting the chlorine-gas water mixture into the main to be disinfected. Chlorinating devices for feeding solutions of the chlorine gas or the gas itself must provide means for preventing the backflow of water into the chlorine cylinder. Liquid chlorine shall be used only by personnel familiar with the proper use of the equipment and the emergency preparedness required with the use of the gas.

4. Chlorine-Bearing Compounds in Water: On approval of the ENGINEER, a mixture of water and a chlorine-bearing compound of known chlorine content may be substituted for liquid chlorine.

5. Compounds to be Used: The chlorine-bearing compounds that may be used are: 1) calcium hypochlorite granules, 2) sodium hypochlorite solutions, and 3) calcium hypochlorite tablets.

6. Preparation of Mixtures: The chlorine water solution is prepared by dissolving or mixing the tablets, granules or solution with water in the proportion required for the desired concentration. The following table gives the amount of chlorine required for each 100 feet of pipe of various sizes for a 50 ppm chlorine dosage.

Pipe Size (Inches)	Volume of 100' Length (Gal)	Chlorine (lb)	1% Chlorine Water Solution (Gal)
4	65.3	0.027	0.33
6	146.5	0.061	0.73
8	261.0	0.108	1.30
10	408.0	0.170	2.04
12	588.7	0.240	2.88

7. Point of Application: The preferred point of application of the chlorinating agent is at the beginning of the pipeline extension or any valved section of it and through a corporation stop inserted in the top of the newly laid pipe. The water injector for delivering the chlorine-bearing water into the pipe should be supplied from a tap on the pressure side of the gate valve controlling the flow into the pipeline extension. In a new system, application of chlorine may be made advantageously at the pump station, the elevated tank, the standpipe, or the reservoir. When property cleaned first, these units are thus chlorinated adequately.

8. Rate of Application: Water from the existing distribution system or other source of supply shall be controlled so as to flow slowly into the newly laid pipeline during the application of chlorine. The rate of chlorine mixture flow shall be in such proportion to the rate of water entering the pipe that the chlorine dose applied to the water entering the newly laid pipe shall produce at least 50 ppm.

9. Preventing Reverse Flow: Valves shall be manipulated so that the strong chlorine solution in the line being treated will not flow back into the line supplying the water. Check valves may be used if desired. Insure that a positive flow is developed in the direction of the new line before chlorinating. Insure that chlorine solution is not allowed to backfeed into the existing system thereby potentially creating a health and safety hazard for system users.

10. Retention Period: Treated water shall be retained in the pipe long enough to destroy a non-spore-forming bacteria. This period should be at least three (3) hours and preferably longer as may be directed.

11. Chlorinating Valves and Hydrants: In the process of chlorinating new laid pipe, all valves or other appurtenances shall be operated when the pipe line is filled with the chlorinating agent.

12. Residual Required: After the chlorine treated water has been retained for the required time, the chlorine residual at pipe extremities and at other representative points shall be at least 5 ppm.

13. Repetition of Procedure: Should the initial treatment fail to result in the conditions specified above, the original chlorination procedure shall be repeated until a 5 ppm residual is obtained.

3.22 Records: CONTRACTOR to complete "Utility Valve Record" and "Utility Pipe Data Sheet" for all valves and pipes. Forms are attached to this Section.

3.23 Boring and Jacking: Refer to Section 07170 – Boring and Jacking – Casing, Pipe and Service Tubing.

PART 4 – MEASUREMENT AND PAYMENT

4.1 Water Service Line Repair:

A. Measurement: Water service line repair, 5/8", 3/4" and 1", including excavation and native backfill, copper CTS x existing line size pack joint, copper CTS x existing line size compression coupling, all other required copper fittings or attachments as required, reconnection of locator wire, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Each service line repaired, tested and accepted.

B. Payment: Water service line repair, measured as provided above, will be paid at the Contract unit price per Each for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work related to the design intent, and per all approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere)(Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere) (Pavement Repair or Replacement Paid Elsewhere) (Select Backfill Paid Elsewhere)(Traffic Control Paid Elsewhere)(Water Pipe Paid Elsewhere)

C. Pay Item:

Water Service Line Repair (5/8", 3/4" and 1" CTS)(04120)(01) per Each

4.2 Water Main Repair:

A. Measurement: Water mains repair, of the various types and sizes, including excavation and native backfill, D.I.M.J. cutting-in-sleeve, D.I.M.J. coupling, all other required D.I.M.J. fittings or attachments as required, polywrap, reconnection of locator wire, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Each water main service line repaired, tested and accepted.

B. Payment: Water main repair, measured as provided above, will be paid at the Contract unit price per Each for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work related to the design intent, and per all approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere)(Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere) (Pavement Repair or Replacement Paid Elsewhere) (Select Backfill Paid Elsewhere)(Traffic Control Paid Elsewhere)(Water Pipe Paid Elsewhere)

C. Pay Items:

2" Water Main Repair (04120)(02) per Each

3" Water Main Repair (04120)(03) per Each

4" Water Main Repair (04120)(04) per Each

6" Water Main Repair (04120)(05) per Each

8" Water Main Repair (04120)(06) per Each

10" Water Main Repair (04120)(07) per Each

12" Water Main Repair (04120)(08) per Each

16" Water Main Repair (04120)(09) per Each

4.3 Water Pipe:

A. Measurement: Water pipe, of the various types and sizes, including excavation and native backfill, polywrap, reconnection of locator wire or new 10 ga. str. cu. locator wire, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per the Linear Foot of water pipe installed, tested and accepted.

B. Payment: Water pipe, measured as provided above, will be paid at the Contract unit price per Linear Foot for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere)(Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere) (Pavement Repair or Replacement Paid Elsewhere) (Select Backfill Paid Elsewhere)(Traffic Control Paid Elsewhere)

C. Pay Items:

5/8", 3/4" and 1" PE SDR-9 CTS Water Service Tubing (04120)(10) per Linear Foot

2" PVC C-900 Water Main (04120)(11) per Linear Foot

3" PVC C-900 Water Main (04120)(12) per Linear Foot

4" PVC C-900 Water Main (04120)(13) per Linear Foot

6" PVC C-900 Water Main (04120)(14) per Linear Foot

8" PVC C-900 Water Main (04120)(15) per Linear Foot

10" PVC C-900 Water Main (04120)(16) per Linear Foot

12" PVC C-900 Water Main (04120)(17) per Linear Foot

16" PVC C-900 Water Main (04120)(18) per Linear Foot

2" PE SDR-11 Water Main (04120)(19) per Linear Foot

3" PE SDR-11 Water Main (04120)(20) per Linear Foot

4" PE SDR-11 Water Main (04120)(21) per Linear Foot

6" PE SDR-11 Water Main (04120)(22) per Linear Foot

8" PE SDR-11 Water Main (04120)(23) per Linear Foot

10" PE SDR-11 Water Main (04120)(24) per Linear Foot

12" PE SDR-11 Water Main (04120)(25) per Linear Foot

16" PE SDR-11 Water Main (04120)(26) per Linear Foot

4.4 Gate Valve and Box Assembly:

A. Measurement: Gate valve and box assembly, of the various sizes, including excavation and native backfill, polywrap, reconnection of locator wire, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Each installed, tested and accepted.

B. Payment: Gate valve and box assembly, measured as provided above, will be paid at the Contract unit price per Each for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere)(Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere)(Pavement Repair or Replacement Paid Elsewhere) (Select Backfill Paid Elsewhere)(Traffic Control Paid Elsewhere)

C. Pay Items:

2" Gate Valve and Box Assembly (04120)(27) per Each

3" Gate Valve and Box Assembly (04120)(28) per Each

4" Gate Valve and Box Assembly (04120)(29) per Each

6" Gate Valve and Box Assembly (04120)(30) per Each

8" Gate Valve and Box Assembly (04120)(31) per Each

10" Gate Valve and Box Assembly (04120)(32) per Each

12" Gate Valve and Box Assembly (04120)(33) per Each

16" Gate Valve and Box Assembly (04120)(34) per Each

4.5 Tapping Saddle and 2" Gate Valve and Box Assembly:

A. Measurement: Tapping saddle and 2" gate valve and box assembly, of the various sizes, including excavation and native backfill, polywrap, reconnection of locator wire, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Each installed, tested and accepted.

B. Payment: Tapping saddle and 2" gate valve and box assembly, measured as provided above, will be paid at the Contract unit price per Each for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and all approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere)(Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere)(Pavement Repair or Replacement Paid Elsewhere)(Select Backfill Paid Elsewhere)(Traffic Control Paid Elsewhere)

C. Pay Items:

2" x 2" Tapping Saddle and Valve Assembly (04120)(35) per Each

3" x 2" Tapping Saddle and Valve Assembly (04120)(36) per Each

4" x 2" Tapping Saddle and Valve Assembly (04120)(37) per Each

6" x 2" Tapping Saddle and Valve Assembly (04120)(38) per Each

8" x 2" Tapping Saddle and Valve Assembly (04120)(39) per Each

10" x 2" Tapping Saddle and Valve Assembly (04120)(40) per Each

12" x 2" Tapping Saddle and Valve Assembly (04120)(41) per Each

16" x 2" Tapping Saddle and Valve Assembly (04120)(42) per Each

4.6 Tapping Sleeve and Valve and Box Assembly:

A. Measurement: Tapping sleeve and tapping gate valve and box assembly, of the various sizes, including excavation and native backfill, polywrap, reconnection of locator wire, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Each installed, tested and accepted.

B. Payment: Tapping sleeve and tapping gate valve and box assembly, measured as provided above, will be paid at the Contract unit price per Each for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere)(Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere) (Pavement Repair or Replacement Paid Elsewhere)(Select Backfill Paid Elsewhere)(Traffic Control Paid Elsewhere)

C. Pay Items:

4" x 2" Tapping Sleeve and Valve Assembly (04120)(43) per Each

4" x 3" Tapping Sleeve and Valve Assembly (04120)(44) per Each

4" x 4" Tapping Sleeve and Valve Assembly (04120)(45) per Each

6" x 2" Tapping Sleeve and Valve Assembly (04120)(46) per Each

6" x 3" Tapping Sleeve and Valve Assembly (04120)(47) per Each

6" x 4" Tapping Sleeve and Valve Assembly (04120)(48) per Each

6" x 6" Tapping Sleeve and Valve Assembly (04120)(49) per Each

8" x 2" Tapping Sleeve and Valve Assembly (04120)(50) per Each

8" x 3" Tapping Sleeve and Valve Assembly (04120)(51) per Each

8" x 4" Tapping Sleeve and Valve Assembly (04120)(52) per Each

8" x 6" Tapping Sleeve and Valve Assembly (04120)(53) per Each

8" x 8" Tapping Sleeve and Valve Assembly (04120)(54) per Each

10" x 2" Tapping Sleeve and Valve Assembly (04120)(55) per Each

10" x 3" Tapping Sleeve and Valve Assembly (04120)(56) per Each

10" x 4" Tapping Sleeve and Valve Assembly (04120)(57) per Each
10" x 6" Tapping Sleeve and Valve Assembly (04120)(58) per Each

10" x 8" Tapping Sleeve and Valve Assembly (04120)(59) per Each

10" x 10" Tapping Sleeve and Valve Assembly (04120)(60) per Each

12" x 2" Tapping Sleeve and Valve Assembly (04120)(61) per Each

12" x 3" Tapping Sleeve and Valve Assembly (04120)(62) per Each

12" x 4" Tapping Sleeve and Valve Assembly (04120)(63) per Each

12" x 6" Tapping Sleeve and Valve Assembly (04120)(64) per Each

12" x 8" Tapping Sleeve and Valve Assembly (04120)(65) per Each

12" x 10" Tapping Sleeve and Valve Assembly (04120)(66) per Each

12" x 12" Tapping Sleeve and Valve Assembly (04120)(67) per Each

16" x 2" Tapping Sleeve and Valve Assembly (042120)(68) per Each

16" x 3" Tapping Sleeve and Valve Assembly (04120)(69) per Each

16" x 4" Tapping Sleeve and Valve Assembly (04120)(70) per Each

16" x 6" Tapping Sleeve and Valve Assembly (04120)(71) per Each

16" x 8" Tapping Sleeve and Valve Assembly (04120)(72) per Each

16" x 10" Tapping Sleeve and Valve Assembly (04120)(73) per Each

16" x 12" Tapping Sleeve and Valve Assembly (04120)(74) per Each

16" x 16" Tapping Sleeve and Valve Assembly (04120)(75) per Each

4.7 Vertically Adjust Valve Box: It is the intent that existing valve boxes requiring vertical adjustment are in an existing state which will allow vertical adjustment without the use of new components. Contractor should base his price based upon possible new items as may be required.

A. Measurement: Vertical adjustment of valve boxes, of the various types and sizes, including new threaded or other D.I. or C.I. extensions, lids and covers as may be required, valve box stabilizers as may be required, concrete for stabilization as may be required, physical raising and leveling vertically, including excavation and native backfill, polywrap, reconnection of locator wire, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Each adjustment made and accepted.

B. Payment: Vertical adjustment of valve boxes, measured as provided above, will be paid at the Contract unit price per Each for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere)(Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere) (Pavement Repair or Replacement Paid Elsewhere) (Select Backfill Paid Elsewhere)(Traffic Control Paid Elsewhere)

C. Pay Item: Vertically Adjusted Valve Box (04120)(76) per Each

4.8 Bore and Jack Water Pipe:

A. Measurement: Boring and jacking of water pipe, of the various sizes, both by conventional and directional means, including bore pits, shoring and or bracing, etc., including excavation and native backfill, new 10 ga. str. cu. locator wire, and including all cleanup and final and or dress grading, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured by the horizontal Linear Foot from bore pit face to bore pit face installed, tested and accepted.

B. Payment: Boring and jacking of water pipe, both by conventional and directional means, measured as provided above, will be paid at the Contract unit price per horizontal Linear Foot from bore pit face to bore pit face for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices. (Select Backfill Paid Elsewhere)(Traffic Control Paid Elsewhere) (Water Main Repair Paid Elsewhere)

C. Pay Items:

1" Bore and Jack (042120)(77) per Linear Foot

2" Bore and Jack (04120)(78) per Linear Foot

3" Bore and Jack (04120)(79) per Linear Foot

4" Bore and Jack (04120)(80) per Linear Foot

6" Bore and Jack (04120)(81) per Linear Foot

8" Bore and Jack (04120)(82) per Linear Foot

10" Bore and Jack (04120)(83) per Linear Foot

12" Bore and Jack (04120)(84) per Linear Foot

16" Bore and Jack (04120)(85) per Linear Foot

1" Bore and Jack (Directional) (04120)(86) per Linear Foot

2" Bore and Jack (Directional) (04120)(87) per Linear Foot

3" Bore and Jack (Directional) (04120)(88) per Linear Foot

4" Bore and Jack (Directional) (04120)(89) per Linear Foot

6" Bore and Jack (Directional) (04120)(90) per Linear Foot

8" Bore and Jack (Directional) (04120)(91) per Linear Foot

10" Bore and Jack (Directional) (04120)(92) per Linear Foot

12" Bore and Jack (Directional) (04120)(93) per Linear Foot

16" Bore and Jack (Directional) (04120)(94) per Linear Foot

Casing Pipe – Bore and Jack (8" – 10") (04120)(95) per Linear Foot

Casing Pipe – Bore and Jack (12" – 14") (04120)(96) per Linear Foot

Casing Pipe – Open Cut (8" – 10") (04120)(97) per Linear Foot

Casing Pipe – Open Cut (12" – 14") (04120)(98) per Linear Foot

4.9 Service Saddle and Corp Stop:

A. Measurement: Service saddle and corp stop, of the various sizes, including excavation and native backfill, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Each installed, tested and accepted.

B. Payment: Service saddle and corp stop, measured as provided above, will be paid at the Contract unit price per Each for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and all approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere)(Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere) (Pavement Repair or Replacement Paid Elsewhere) (Select Backfill Paid Elsewhere)(Traffic Control Paid Elsewhere) (PE Service Tubing Paid Elsewhere)

C. Pay Items:

2" x 1" Saddle and Corp Stop (04120)(99) per Each

3" x 1" Saddle and Corp Stop (04120)(100) per Each

4" x 1" Saddle and Corp Stop (04120)(101) per Each

6" x 1" Saddle and Corp Stop (04120)(102) per Each

8" x 1" Saddle and Corp Stop (04120)(103) per Each

10" x 1" Saddle and Corp Stop (04120)(104) per Each

12" x 1" Saddle and Corp Stop (04120)(105) per Each

16" x 1" Saddle and Corp Stop (04120)(106) per Each

4.10 Water Meter Assembly:

A. Measurement: Water Meter Assemblies, including copper inlet and outlet valves, copper pack joints, copper compression fittings, meter with encoder connection and or with encoder connection and encoder, encoder register, pigtail, copper setting yoke, plastic meter box, connection to existing service, including excavation and native backfill, reconnection of locator wire, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Each installed, tested and accepted.

B. Payment: Water Meter Assemblies, measured as provided above, will be paid at the Contract unit price per Each for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and all approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere)(Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere)(Pavement Repair or Replacement Paid Elsewhere)(Select Backfill Paid Elsewhere)(Traffic Control Paid Elsewhere) (PE Service Tubing Paid Elsewhere)

C. Pay Items:

5/8" x ¾" Water Meter Assembly (Badger "E" Series) (Including Endpoint and Endpoint Connection) (04120)(107)(01) per Each

1" Water Meter Assembly (Badger "E" Series) (Including Endpoint and Endpoint Connection) (04120)(107)(02) per Each

1½" Water Meter Assembly (Badger "E" Series) (Including Endpoint and Endpoint Connection) (04120)(108) per Each

2" Water Meter Assembly (Badger "E" Series) (Including Endpoint and Endpoint Connection) (04120)(109) per Each

3" Badger Compound Water Meter Including Strainer (04120)(110) per Each

4" Badger Compound Water Meter Including Strainer (04120)(111) per Each

6" Badger Compound Water Meter Including Strainer (04120)(112) per Each

4.11 Replace Water Meter:

A. Measurement: Replacement of Water Meters, will include the remval of the existing from the existing meter setting and the installation of a new meter with encoder connection and or with encoder connection and encoder, encoder register, pigtail, and re-connection to the existing meter setting, including excavation and native backfill, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Each installed, tested and accepted.

B. Payment: Water Meter Assemblies, measured as provided above, will be paid at the Contract unit price per Each for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and all approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere)(Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere)(Pavement Repair or Replacement Paid Elsewhere)(Select Backfill Paid Elsewhere)(Traffic Control Paid Elsewhere) (PE Service Tubing Paid Elsewhere)

C. Pay Items:

Replace 5/8" x ¾" Water Meter Assembly (Badger "E" Series) (Including Endpoint and Endpoint Connection) (04120)(112)(01) per Each

Replace 1" Water Meter Assembly (Badger "E" Series) (Including Endpoint and Endpoint Connection) (04120)(112)(02) per Each

Replace 1½" Water Meter Assembly (Badger "E" Series) (Including Endpoint and Endpoint Connection) (04120)(112)(03) per Each

Replace 2" Water Meter Assembly (Badger "E" Series) (Including Endpoint and Endpoint Connection) (04120)(112)(04) per Each

Replace 3" Badger Compound Water Meter Including Strainer (04120)(112)(05) per Each

Replace 4" Badger Compound Water Meter Including Strainer (04120)(112)(06) per Each

Replace 6" Badger Compound Water Meter Including Strainer (04120)(112)(07) per Each

4.12 D.I.M.J. Fittings:

A. Measurement: D.I.M.J. fittings, exclusive of nuts and bolts, separate restraints, special fittings and or adapters, of the various sizes, including excavation and native backfill, polywrap, reconnection of locator wire, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured by the TON installed, tested and accepted.

B. Payment: D.I.M.J. fittings, measured as provided above, will be paid at the Contract unit price per TON for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work related to the design intent, and per all approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere)(Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere) (Pavement Repair or Replacement Paid Elsewhere) (Select Backfill Paid Elsewhere)(Traffic Control Paid Elsewhere)

C. Pay Item:

D.I.M.J. Fittings (04120)(113) per TON

4.13 D.I.M.J. Restraints:

A. Measurement: D.I.M.J. restraints, including nuts and bolts, etc., of the various sizes, including excavation and native backfill, polywrap, reconnection of locator wire, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Each installed, tested and accepted.

B. Payment: D.I.M.J. restraints, measured as provided above, will be paid at the Contract unit price per Each for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work related to the design intent, and per all approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere)(Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere) (Pavement Repair or Replacement Paid Elsewhere) (Select Backfill Paid Elsewhere)(Traffic Control Paid Elsewhere)

C. Pay Items:

3" D.I.M.J. Restraint (04120)(114) per Each

4" D.I.M.J. Restraint (04120)(115) per Each

6" D.I.M.J. Restraint (04120)(116) per Each

8" D.I.M.J. Restraint (04120)(117) per Each

10" D.I.M.J. Restraint (04120)(118) per Each

12" D.I.M.J. Restraint (04120)(119) per Each

16" D.I.M.J. Restraint (04120)(120) per Each

4.14 Pipe Bell Restraints:

A. Measurement: Pipe bell restraints, including rods, nuts and bolts, etc., of the various sizes, including excavation and native backfill, polywrap, reconnection of locator wire, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Each installed, tested and accepted.

B. Payment: Pipe bell restraints, measured as provided above, will be paid at the Contract unit price per Each for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere)(Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere) (Pavement Repair or Replacement Paid Elsewhere)(Select Backfill Paid Elsewhere)(Traffic Control Paid Elsewhere)

C. Pay Items:

3" Pipe Bell Restraint (04120)(121) per Each

4" Pipe Bell Restraint (04120)(122) per Each

6" Pipe Bell Restraint (041200)(123) per Each

8" Pipe Bell Restraint (041200)(124) per Each

10" Pipe Bell Restraint (04120)(125) per Each

12" Pipe Bell Restraint (04120)(126) per Each

16" Pipe Bell Restraint (04120)(127) per Each

4.15 Temporary Flushing Assembly:

A. Measurement: Temporary flushing assemblies, etc., of the various sizes, including M.J. x flange main line size x 4" reducer, 4" flanged gate valve with valve box and lid, 4" flanged pipe and elbows, removal upon completion, and main line size M.J. restrained cap, etc., including excavation and native backfill, polywrap, reconnection of locator wire, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Each installed, and removed.

B. Payment: Temporary flushing assemblies, measured as provided above, will be paid at the Contract unit price per Each for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere)(Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere) (Pavement Repair or Replacement Paid Elsewhere)(Select Backfill Paid Elsewhere)(Traffic Control Paid Elsewhere)

C. Pay Items:

2" Temporary Flushing Assembly (04120)(128) per Each

4" Temporary Flushing Assembly (04120)(129) per Each

6" Temporary Flushing Assembly (04120)(130) per Each

8" Temporary Flushing Assembly (04120)(131) per Each

10" Temporary Flushing Assembly (04120)(132) per Each

12" Temporary Flushing Assembly (04120)(133) per Each

16" Temporary Flushing Assembly (04120)(134) per Each

4.16 Fire Hydrant Assembly:

A. Measurement: Fire hydrant assembly, including main line size x 6" D.I.M.J. anchoring tee, 6" D.I.M.J. gate valve with C.I. valve box and lid, concrete valve pad, 6" D.I. anchoring pipe (lead pipe), 6" D.I.M.J. fittings as required for City of Alexandria Type II assembly, buried sacked and precast concrete pad, fire hydrant riser and extensions as required, 5 1/4" fire hydrant with safety break-away, City of Alexandria standard threads and nozzles, painting, etc., including excavation and native backfill, polywrap, reconnection of locator wire, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Each installed, tested and accepted.

B. Payment: Fire hydrant assembly, measured as provided above, will be paid at the Contract unit price per Each for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere)(Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere) (Pavement Repair or Replacement Paid Elsewhere)(Select Backfill Paid Elsewhere)(Traffic Control Paid Elsewhere)

C. Pay Item: Fire Hydrant Assembly – Type II (04120)(135) per Each

4.17 Harvey Adapter:

A. Measurement: Harvey adapters, of the various sizes, including back-up drive ring, including excavation and native backfill, reconnection of locator wire, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Each installed, and accepted.

B. Payment: Harvey adapter, measured as provided above, will be paid at the Contract unit price per Each for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere)(Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere) (Pavement Repair or Replacement Paid Elsewhere)(Select Backfill Paid Elsewhere)(Traffic Control Paid Elsewhere)

C. Pay Items:

3" PE Harvey Adapter (04120)(136) per Each

4" PE Harvey Adapter (04120)(137) per Each

6" PE Harvey Adapter (04120)(138) per Each

8" PE Harvey Adapter (04120)(139) per Each

10" PE Harvey Adapter (04120)(140) per Each

12" PE Harvey Adapter (04120)(141) per Each

16" PE Harvey Adapter (04120)(142) per Each

4.18 Remove and Salvage Fire Hydrant:

A. Measurement: Remove and salvage fire hydrant, including excavation and native backfill, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per each installed, and removed.

B. Payment: Remove and salvage fire hydrant, measured as provided above, will be paid at the Contract unit price per Each for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere)(Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere) (Pavement Repair or Replacement Paid Elsewhere)(Select Backfill Paid Elsewhere)(Traffic Control Paid Elsewhere)

C. Pay Item: Remove and Salvage Fire Hydrant (04120)(143) per Each

4.19 Chlorination Points:

A. Measurement: Chlorination points, located as directed by the Engineer, including coordination with City of Alexandria personnel and performed to the satisfaction of the on-site City Inspector, including excavation and native backfill, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Each installed, and removed.

B. Payment: Chlorination points, measured as provided above, will be paid at the Contract unit price per Each for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere)(Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere) (Pavement Repair or Replacement Paid Elsewhere)(Select Backfill Paid Elsewhere)(Traffic Control Paid Elsewhere)

C. Pay Item: Chlorination Points (04120)(144) per Each

4.20 Hydrostatic Testing and Chlorination of Water Mains:

A. Measurement: Hydrostatic testing and chlorination of water mains, including coordination with City of Alexandria personnel and performed to the satisfaction of the on-site City Inspector, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Linear Foot tested and accepted.

B. Payment: Hydrostatic testing and chlorination of water mains, measured as provided above, will be paid at the Contract unit price per Linear Foot for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere)(Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere) (Pavement Repair or Replacement Paid Elsewhere)(Select Backfill Paid Elsewhere)(Traffic Control Paid Elsewhere)

C. Pay Item:

Testing and Chlorination of Water Mains (04120)(145) per Linear Foot

Hydrostatic Testing of Pressure Mains (Water/SFM) (04120)(146) per Linear Foot

4.21 Insert Valve:

A. Measurement: Insert valves, either using a single tapping type insert-a-valve or, inserting a valve using standard manual means and normal mechanical components, of the various sizes, including D.I.M.J couplings, D.I.M.J. cutting-in sleeve, pipe spools, etc., including excavation and native backfill, polywrap, reconnection of locator wire, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Each installed, tested and accepted.

B. Payment: Insert valves, measured as provided above, will be paid at the Contract unit price per Each for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere)(Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere) (Pavement Repair or Replacement Paid Elsewhere)(Select Backfill Paid Elsewhere)(Traffic Control Paid Elsewhere)

C. Pay Items:

4" Insert Valve (04120)(147) per Each

6" Insert Valve (04120)(148) per Each

8" Insert Valve (04120)(149) per Each

10" Insert Valve (04120)(150) per Each

12" Insert Valve (04120)(151) per Each

16" Insert Valve (04120)(152) per Each

4.22 Double Cut and Cap Water Mains:

A. Measurement: Cut and cap of water mains including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Each.

B. Payment: Cut and cap of water mains, measured as provided above, per each double cut and double cap made, will be paid at the Contract unit price per Each double cut and double cap made, installed and accepted.

C. Pay Items:

Double Cut and Cap 4" Water Main (04120)(153) per Each

Double Cut and Cap 6" Water Main (04120)(154) per Each

Double Cut and Cap 8" Water Main (04120)(155) per Each

Double Cut and Cap 10" Water Main (04120)(156) per Each

Double Cut and Cap 12" Water Main (04120)(157) per Each

Double Cut and Cap 16" Water Main (04120)(158) per Each

Double Cut and Cap 24" Water Main (04120)(159) per Each

4.23 Connections to Mains:

A. Measurement: Connection of 6" mains to existing fire hydrant with 6" gate valve and valve box assembly and, connection of existing water service line to existing new mains including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Each.

B. Payment: Connection as outlined herein, measured as provided above, per each double cut and double cap made, will be paid at the Contract unit price per Each connection made, installed and accepted.

C. Pay Items:

Connect 6" Main to Existing Fire Hydrant With 6" Gate Valve and Valve Box Assembly (04120)(160) per Each

Connections of Existing Water Service Lines to Mains (04120)(161) per Each

SECTION 04120 – BORING AND JACKING – PIPE AND SERVICE TUBING
REFERENCE - NO PAY ITEM: *Install Pipe by Boring Method: (Refer to Section 04120 – Water Distribution System and Related Appurtenances.*

(See "Utility Valve Record" Attached)

(See "Utility Pipe Data Sheet" Attached)

- END OF SECTION -

UTILITY VALVE RECORD

Contents to be handled: _____ gas – water – sewer _____
(circle one)

Location/address: _____

_____

_____

_____

Size: _____ Make: _____ Type: _____

Valve pressure rating: _____ Gearing: _____

By-pass: _ yes/no __ Size and type of By-pass valve: _____
(circle one)

Opens: Clockwise/Counter-clockwise Turns to operate: _____
(circle one)

Set in: _____

Depth to operating nut: _____

Remarks/Comments: _____

_____

_____

_____

_____

Date of installation: _____ Contractor: _____

Sketch of valve location:

UTILITY PIPE DATA SHEET

Project Name: _____

Date of Installation: _____ Contractor: _____

Location & Description of Project:

_____

_____

_____

_____

_____

_____

DATA	CARRIER PIPE	CASING (if used)
Contents to be handled (water, gas, sewer)		
Pipe Material		
Specification & Grade of Pipe		
Outside Diameter		
Wall Thickness		
Yield Strength (PSI)		
Maximum allowable operating pressure (PSIG)		
Type of Joint (welded, mechanical, butt-fused)		
Method of installation (bore, open cut)		
Average depth of pipe		
Coating material		
Cathodic protection		
Length of pipe		

CITY OF ALEXANDRIA, LOUISIANA

ANNUAL REQUIREMENTS CONTRACT
FOR
WATER, WASTEWATER, NATURAL GAS AND
GENERAL (SITE RELATED) SYSTEMS
2026

PART 5 - WASTEWATER

Section 05110 - GRAVITY SANITARY SEWER SYSTEM AND RELATED APPURTENANCES
Section 05120 - SANITARY SEWER MANHOLES
Section 05140 - INFILTRATION AND INFLOW (I&I) - GENERAL
Section 05150 - SMOKE TESTING
Section 05160 - TELEVISION (CCTV) INSPECTION
Section 05170 - SEWER LINE CLEANING
Section 05172 - ROOT REMOVAL
Section 05174 - CHEMICAL ROOT TREATMENT
Section 05180 - GRAVITY SEWER MAIN POINT REPAIRS
Section 05190 - GRAVITY SEWER MAIN REPLACEMENT
Section 05210 - GRAVITY SEWER SERVICE LINE POINT REPAIRS
Section 05220 - GRAVITY SEWER SERVICE LINE REPLACEMENT
Section 05230 - GRAVITY SEWER BY-PASS PUMPING
Section 05240 - SEWER MANHOLE INSPECTION
Section 05250 - MISCELLANEOUS SEWER MANHOLE REPAIRS
Section 05260 - SEWER MANHOLE, WET PIT AND OTHER STRUCTURES – INTERIOR RECONSTRUCTION AND COATINGS SYSTEMS
Section 05262 - SEWER MANHOLE TOTAL LINING SYSTEM
Section 05270 - RECONSTRUCTION OF SEWER MAINS (8" AND LARGER) BY CURED-IN-PLACE PIPE (C.I.P.P.)
Section 05272 - LATERAL RECONSTRUCTION FROM SEWER MAIN BY C.I.P.P.
Section 05280 - RECONSTRUCTION OF SEWER MAINS (8" AND LARGER) BY PIPE BURSTING
Section 05290 - TEMPORARY FLOW MONITORING AND FLOW ISOLATION
Section 05300 - MISCELLANEOUS UTILITY ITEMS
Section 05310 - SEWER LIFT STATION CONTROL PANEL

SECTION 05110

GRAVITY SANITARY SEWER SYSTEM AND RELATED APPURTENANCES

PART 1 - GENERAL

1.1 Scope: This Section covers all operations, materials and incidentals necessary to install new gravity sanitary sewers and appurtenances and repairs, replacement and rehabilitation related thereto.

1.2 Quality Assurance:

A. Pipes shall be laid true to the lines and grades to invert grades to which the work shall conform. Work rejected shall be corrected by the CONTRACTOR at his own expense in a manner acceptable to the ENGINEER.

B. The CONTRACTOR shall demonstrate his proposed methods of maintaining the grade and alignment of pipe during construction with the ENGINEER before the start of construction.

C. The CONTRACTOR shall furnish all labor, material and tools to establish and maintain all lines and grades. Such tools and materials as are required for the work and furnished by the CONTRACTOR shall be approved by the ENGINEER.

1.3 Applicable Publications: The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.

A. American Society for Testing and Materials (ASTM) Publications:

A74	Specification for Cast Iron Soil Pipe and Fittings
D 698-78	Test Methods for Moisture - Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb. (2.49 kg) Rammer and 12 inch (304.8 mm) Drop
D1248	Polyethylene Plastic Molding and Extrusion Materials
D1784	Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
D2241	Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR-Series)
D 2487-85	Classification of Soils for Engineering Purposes
D3034	Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings

D3139	Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
D3212	Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
F477	Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

B. State of Louisiana Department of Transportation and Development, "Louisiana Standard Specifications for Roads and Bridges, 2006 Edition"

Section 1003-	Aggregates

C. UNI-BELL PVC Pipe Association:

UNI-B-1	Thermoplastic Pipe Joints, Pressure and Nonpressure Applications
UNI-B-4	Polyvinyl Chloride (PVC) Plastic Gravity Sewer Pipe and Fittings (Nominal Diameters 4 - 15 Inches)
UNI-B-6	For Low-Pressure Air Testing of Installed Sewer Pipe

D. American Water Works Association:

C105	Polyethylene Encasement for Ductile-Iron Pipe Systems
C111	Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
C150	Thickness Design of Ductile Iron Pipe
C151	Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids
C153	Ductile - Iron Compact Fittings, 3 Inch through 12 Inch (75mm through 300mm) for Water and Other Liquids
C600	Installation of Ductile Iron Water Mains and Their Appurtenances
C900	Polyvinyl Chloride (PVC) Pressure Pipe, 4 Inch through 12 Inch, for Water

1.4 Submittals: Submit shop drawings or material data cut sheets of the gravity sanitary sewers and appurtenances in accordance with Section 03340 - Shop Drawings, Samples and Project Data.

1.5 Product Delivery, Storage and Handling:

A. Inspection of Material at Delivery Point:

1. When delivered to the site, and prior to unloading, the CONTRACTOR shall inspect all pipe, manhole, frames and covers, and accessories for loss, damage or lack of specified identification and markings.

2. Any defective or improper material shall be immediately marked and shall not be unloaded.

B. Handling: In shipping, storing and installing pipe, manholes and accessories shall be kept in a sound, undamaged condition. They shall, at all time, be handled with care and shall not be dropped, dumped or bumped against any other object. Any material(s) damaged shall be marked and immediately removed from the job site.

C. Storing: Pipe shall be stored off the ground on sticking or pallets. Pipe shall be stacked with spigot ends projecting from the stack in opposite directions for alternate rows.

D. Defective Materials: All materials found at any time during the progress of the work to have cracks, flaws or other defects will be rejected and marked and the CONTRACTOR shall promptly remove such defective material from the work site.

PART 2 - PRODUCTS

2.1 Piping and Fittings:

A. Gravity Sewer Pipe and Related Appurtenances:

1. P.V.C. Gravity Sewer Pipe (Push-On Joints): P.V.C. gravity sewer pipe shall comply with ASTM D3034 or UNI-B-4. The pipe shall be of Type PSM Poly Vinyl Chloride with a standard dimension ratio (SDR) of 26. Pipe and fittings shall have an integral bell with elastomeric seal joints. The joints shall comply with ASTM D3212 or UNI-B-1. Gaskets shall comply with ASTM F477. Joint lubricants shall be as recommended by the pipe manufacturers. Pipe shall be as specified below:

4" thru 12" - PVC - DR 26 ASTM D3034

2. PVC Gravity Sewer Pipe (Push-On Internally Restrained Joints): Plastic pipe shall be polyvinyl chloride (PVC) conforming to ASTM D1784 with integral

bell push-on internally restrained joints conforming to ASTM D3139. PVC pipe shall have a whiteshell. The requirements for the specific type of plastic pipe to be used under this project shall be as given below unless otherwise noted on the Drawings.

4" thru 12" – PVC – DR 21 (ASTM D 1784; D 2241)

The pipe shall have an integral bell, rubber gasket internally restrained joint and shall be capable of direct tapping. The PVC pipe shall be approved by the National Sanitation Foundation for potable water pipe and said stamp be inclusive on the pipe furnished along with the nominal size O.D., pressure class, dimensional ratio, and the manufacturer's name or trademark which shall be Eagle Loc 900 as manufactured by J.M. Eagle, Cetra-Lok C900 RJIB as manufactured by North American Specialty Products, or equal.

3. Ductile Iron Gravity Sewer Pipe: Ductile cast iron (DI) gravity sewer pipe shall comply with ANSI/AWWA-C150/A21.50 specifications and shall have push-on joints. If not designated as such on the Drawings, pipe shall be push-on joint. Pipe shall be furnished in eighteen (18) or twenty (20) foot nominal length joints. Required mechanical joint pipe will be specifically designated on Drawings. Pipe shall be manufactured in accordance with ANSI/AWWA-C151/A21.51 and ANSI/AWWA-C111/A21.11 Specifications. Pipe shall be as specified below:

4" - 12" - Ductile Iron - Pressure Class 350

All ductile iron pipe and fittings shall have a high build protective lining on the interior and a bituminous coating on the exterior. The entire interior of the ductile iron pipe and fittings shall not have been lined with any substance prior to the application of the specified lining. The material used for lining the pipe and fittings shall have a successful history of protecting pipe lines in sewer service. The material shall be a high build multi-component Amine cured Novalac Epoxy lining and shall contain at least 20% ceramic quartz pigment. The standard of quality is Protecto 401 Ceramic Epoxy. The lining shall be applied by a competent firm with a successful history of applying linings to the interior of ductile iron pipe and fittings. Prior to abrasive blasting, the entire area which will receive the protective compound shall be inspected for oil, grease, etc. Any areas where oil, grease, or any substance which can be removed by solvent is present shall be solvent cleaned using the guidelines outlined in SSPC-1 Solvent Cleaning. After the surface has been made free of grease, oil or other substances, all areas to receive the protective compounds shall be abrasive blasted using compressed air nozzles with sand or grit abrasive media. The entire surface to be lined shall be struck with the blast media so that all rust, loose oxides, etc., are removed from the surface. Only slight stains and tightly adhering annealing oxide may be left on the surface. Any area where rust reappears before coating must be reblasted to remove all rust.

After the surface preparation and within eight (8) hours of surface preparation, the interior pipe shall receive 40 mils dry film thickness of the protective lining. No

lining operations shall take place when the substrate or amblent temperature is below 40 degrees Fahrenheit. The surface also must be dry and dust free. If flanged fittings or pipe are included in the project, the lining must not be used on the face of the flange; however, full face gaskets must be used to protect the ends of the pipe. All fittings shall be lined with 40 mils of the protective lining. The 40 mil system shall not be applied in the gasket grooves. Due to the tolerances involved, the gasket area and spigot end up to six inches (6") back from the end of the spigot end must be coated with 6 mils nominal, 10 mils maximum Protecto Joint Compound. This coating shall be applied by brush to ensure coverage. Care should be taken that the coating is smooth without excess buildup in the gasket groove or on the spigot end. All materials for the gasket groove and spigot end shall be applied after the application of the lining. Protecto Joint Compound shall be used for touch-up or repair. Procedures shall be in accordance with manufacturer's recommendations. The pipe or fitting manufacturer must supply a certificate attesting that the lining meets the requirements of this Specification, and that the material used was as specified, and that the material was applied as required by the Specification.

DI pipe shall be laid within a polyethylene tube (polytube) made of eight (8) mil virgin polyethylene. Polyethylene tube shall conform to AWWA C105 specifications. Film shall be Class "C" - Black, with a minimum nominal thickness of .008 inches (8 mils). Tape for securing the film shall be thermoplastic material with a pressure sensitive adhesive face capable of bonding to metal, bituminous coating and polyethylene. Tape shall have a minimum thickness of 8 mils, and a minimum width of one inch. The polyethylene film envelope shall be free as is commercially possible of gels, streaks, pinholes, particles of foreign matter, and undispersed raw materials. There shall be no other visible defect such as holes, tears, blisters, or thinning out at folds. The manufacturer shall furnish a certification of conformance of the material to the requirement of AWWA C105 or ANSI A21.5. The polywrap shall be as manufactured by Dupont or approved equal. The tape shall be Scotch Wrap No. 50 or approved equal.

4. Cast Iron Soil Pipe: Cast iron soil pipe shall conform to the standards and requirements of the Cast Iron Soil Pipe Institute and shall conform to ASTM A-74.

5. Production: Manufacturers of sewer pipe shall have an established track record for pipe production under the same corporate name for a period of at least five (5) years.

B. Gravity Sewer Fittings - PVC, Cast Iron Soil Pipe, Ductile Iron Pipe, Cleanouts and Miscellaneous:

1. Fittings for PVC pipe must be manufactured to the same specifications as the pipe to which it is to be attached. PVC fittings shall have push-on gasketed joints.

2. Fittings for gravity ductile iron pipe shall be ductile iron, push-on or mechanical joint meeting AWWA C153, and polyethylene lined as specified above. Fittings shall be wrapped with eight (8) mil thickness of polytube as specified under Paragraph 2.1.A.3 - Ductile Iron Gravity Sewer Pipe of this Section.

3. Cast Iron soil pipe fittings shall conform to ASTM A-74. Hub adapters may be "Multi-Fit" 282244 cast iron soil pipe spigot adapter hub-by-hub with soilpipe hub gasket or PVC to cast iron soil pipe coupling as manufactured by Atlas or Fernco.

4. Adapter couplings to connect ductile iron pipe shall be specifically designed for the intended purpose and approved by the ENGINEER and provided as part of the ductile iron pay item. FERNCO adapter couplings are approved.

5. The service cleanout wye shall be a combination wye and 1/8th bend as manufactured by Tyler Corporation, Part No. ASA 021-0813 or approved equal.

6. The service cleanout frame and cover shall be Bass and Hayes Model 404 with bolt on lid or approved equal.

7. Adapter couplings to connect cast iron soil piping and fittings to PVC pipe shall be specifically designed for the intended purpose and approved by the ENGINEER and provided as part of the clean-out pay item.

C. PE Gravity Sewer Pipe: Refer to Section 04120 – Water Distribution System and Related Appurtenances; paragraph 2.1.C.3; PE Water Pipe; 4" – 36".

D. General Note: Where it is necessary to join pipes of different types, the CONTRACTOR shall furnish and install the necessary adapters. Adapters shall have ends conforming to specifications for the appropriate type of joint to receive the adjoining pipe and shall be approved by the ENGINEER.

2.2 Bedding and Haunching Material: All bedding and haunching material shall be ASTM Class I or Class II soils as shown on the following table:

SOIL CLASS	SOIL TYPE	DESCRIPTION OF MATERIAL CLASSIFICATION
CLASS I SOILS	----	Manufactured angular, granular material, ¼ to 1½ inches (6 to 40 mm) size such as crushed stone or rock, broken coral, crushed slag, cinders, or crushed shells.
CLASS II SOILS	GW	Well-graded gravels and gravel - sand mixtures, little or no fines. 50% or more retained on No. 4 sieve. More than 95% retained on No. 200 sieve. Clean.
	GP	Poorly graded gravels and gravel - sand mixtures, little or no fines. 50% or more retained on No. 4 sieve. More than 95% retained on No. 200 sieve. Clean.
	SW	Well-graded sands and gravelly sands, little or no fines. More than 50% passes No. 4 sieve. More than 95% retained on No. 200 sieve. Clean.
	SP	Poorly graded sands and gravelly sands, little or no fines. More than 50% passes No. 4 sieve. More than 95% retained on No. 200 sieve. Clean.

To prevent the migration of materials, the void ratio of the bedding material shall be equal to or less than the void ratio of the haunching material.

2.3 Initial Backfill Material (Unpaved Areas): Initial backfill material shall be Class I or Class II material as described in Paragraph 2.2 Bedding and Haunching Material.

2.4 Final Backfill Material (Unpaved Areas): Final backfill material shall be satisfactory native materials and shall be compacted in accord with Section 07150 - Excavation, Backfill and Compaction of Utility Trenches of these Specifications.

2.5 Foundation Material: Refer to Section 07280 – Bedding, Type C and/or R as directed.

2.6 Concrete Cradle: Refer to Section 07330 - Cast-In-Place Concrete.

2.7 Couplings: The Contractor shall use couplings that are resistant to the corrosive action of the soils and sewage and provide a permanent watertight joint.

A. Shear Resistant Couplings: Connections between existing and new pipe shall be jointed with shear resistant repair couplings conforming to ASTM C425-91 and ASTM C1173-91. The stainless steel shear rings and clamping bands used in conjunction with the molded rubber sleeve shall conform to ASTM A167-97.316 Series. When using the shear resistant coupling, the gap between the new and existing pipes shall be no more

than 1/4". Shear resistant couplings shall be Flex-Seal Adjustable Repair Couplings as manufactured by Mission Rubber Products, Fernco Systems, or approved equal.

B. Flexible Couplings: When non-shear repair couplings are not manufactured for a particular size or material, connections between existing and new pipe shall be jointed using flexible elastomer couplings with a 316 stainless steel band for each end and adjusting screws capable of sustaining an applied torque in excess of 80 inch-pounds. When using the flexible coupling, the gap between the new and existing pipes shall be no more than 1/4". Flexible couplings shall be Fernco devices as manufactured by Fernco Systems, Mission Rubber Products, Mercer Rubber Company, or approved equal.

2.8 PE To M.J. Adapters: Refer to Section 04120 – Water Distribution System and Related Appurtenances; paragraph 2.13; PE to M.J. Adapters.

2.9 Caps and Plugs: Where existing lines are to be abandoned, the ends shall be cut and fitted with an appropriately sized cap or plug. The cap or plug material may be PVC. The capped end shall be backfilled with compacted native material in such a manner as to ensure the integrity of the cap.

PART 3 - EXECUTION

3.1 General: All pipe, appurtenances and accessories shall be installed true to lines, grades and locations. Any deviations must be approved by the ENGINEER before installation.

3.2 Excavation, Backfill and Compaction: Refer to Section 07150 - Excavation, Backfill and Compaction of Utility Trenches.

3.3 Pipe Boring and Jacking: Refer to Section 07170 – Boring and Jacking – Casing, Pipe and Service Tubing.

3.4 Pipe Embedment Conditions:

A. All pipes and specials laid in open trench excavations shall be haunched and bedded in and uniformly supported over their full length on material of the types specified. Flat-bottomed trenches shall be excavated and dewatered in accordance with the Specifications for excavation and backfill in Section 07150 - Excavation, Backfill and Compaction of Trenches, prior to preparing the specified embedment conditions. All work shall be performed in a dry trench. Where embedment conditions of a higher type are ordered as a result of the CONTRACTOR'S method of operation, the CONTRACTOR shall be due no additional compensation. All foundations, bedding, haunching, initial backfill and final backfill shall be constructed to the widths, depths and compaction requirements as specified herein.

B. Gravity sewer pipe shall be installed as specified herein. The pipe shall be installed in an envelope of ASTM D2321 Class I or Class II material. This envelope shall include bedding material, haunching material, initial backfill and if required, foundation material.

3.5 Installation of Polyethylene Wrap: Refer Section 04120 - Water Distribution System and Related Appurtenances; paragraph 3.7; Installation of Polyethylene Wrap.

3.6 Concrete Cradle: Where required by unstable trench conditions and where authorized by the ENGINEER, the pipe shall be bedded in a monolithic cradle of concrete. Refer to Section 07330 – Cast-In-Place Concrete.

3.7 Inspection of Pipe Before Installation: All pipe, fittings and specials shall be carefully inspected in the field before lowering in the trench. Cracked, broken, warped, out of round or otherwise defective pipe, fittings or specials, as determined by the CONTRACTOR or the ENGINEER, shall be pulled and not installed. Such rejected pipe shall be clearly tagged in such manner as not to deface or damage it, and the pipe shall then be removed from the job site by the CONTRACTOR at his own expense.

3.8 Installation of Gravity Sewer Pipe and Fittings:

A. After the trench has been brought to the proper grade, as herein before specified, the pipe and specials shall be laid in strict accordance with manufacturer's recommendations.

B. All pipe, fittings and specials shall be carefully lowered into the trench with ropers, slings and proper equipment. Pipe becoming cracked or otherwise damaged during or following installation shall be marked by the CONTRACTOR or ENGINEER and removed from the site as required in the preceding clause.

C. Pipes shall be laid true to the grades as directed by the ENGINEER. Each section of pipe shall rest upon the pipe bed or haunching for the full length of its barrel, with recesses excavated to accommodate bells and joints. Blocking will not be permitted except where the pipe is to be encased in concrete. Any pipe that has its grades or joints disturbed after laying shall be taken up and relayed.

D. The interior and ends of all pipe shall be thoroughly cleaned of all foreign matter before being lowered into the trench and shall be kept clean during laying operations by means of plugs or other approved methods. Under no circumstances shall pipe be laid in water and no pipe shall be laid when trench conditions or the weather is unsuitable for such work except by permission of the ENGINEER. In all cases, water shall be kept out of the trench until the concrete encasement or cradle, where used, has hardened or until the pipe sidefills have been placed.

E. Every precaution shall be taken which, in the opinion of the ENGINEER, is necessary to obtain watertight construction for all joints and all joints with manholes or existing facilities. The CONTRACTOR shall also take any and all other measures to keep the pipe clean and free from deposits, and protect same from injury until final inspection.

F. Sewer lines shall be tested for leakage between manholes as the work progresses by infiltration or exfiltration tests and air testing defined under this Section.

G. If the sewer is damaged from any cause, or becomes either partly or completed filled with dirt, stones, sand or other debris, the CONTRACTOR shall make all necessary repairs, and remove all such material to the satisfaction of the ENGINEER, without further charge and, upon refusal or failure to do so, it shall be done by the OWNER and the cost thereof shall be charged as money paid to the CONTRACTOR.

H. The ENGINEER may make tests as may be deemed necessary, in order to ascertain if the sewer is true to line and grade. In case the tests show poor alignment of the main, misplaced pipe or other defects, such defects shall be remedied by the CONTRACTOR to the satisfaction of the ENGINEER.

I. Recommendations of manufacturer must be allowed in laying pipe with special joints as specified.

J. Where ductile iron gravity sewer mains and services are installed they shall be wrapped with an eight (8) mil thick polytube as specified under Paragraph 2.1.A.3 of this section.

3.9 Line and Grade:

A. Do not deviate from line and grade, as established by the ENGINEER, more than ½" for line and ¼" for grade, provided that such variation does not result in a level or reverse sloping invert. To account for permissible variation in the pipe wall thickness, the measurement for grade shall be at the pipe invert, not at the top of the pipe. The CONTRACTOR shall furnish and set the line and grade boards at maximum intervals of 25 feet. If grade boards prove impracticable because of trench or other conditions, other methods of controlling line and grade (including laser beam) may be submitted to the ENGINEER for approval.

B. A substantial stake shall be driven on each side of the trench on a line at right angles to each stake of the primary line. A straight and even-edged two (2") inch by six (6") inch board shall be nailed or clamped to the stakes in a level position and at some even foot height above the grade line of the proposed sewer. The centerline of the proposed sewer shall be located by measurement from the primary line stake and marked upon the board. Not less than three (3) such line and grade boards shall be set and immediately checked visually for errors in line and grade. As each additional board is placed, it shall be checked visually for errors in line and grade. At least three (3) boards shall be maintained at all times. During the laying of the pipe, a stout twill line shall be fastened to the boards at the center of alignment marks and pulled sufficiently tight to remove any noticeable or measurable sag. The line and grade of each pipe shall be obtained by measuring down from the string line by means of a plumbed grade pole.

C. The CONTRACTOR may use the laser beam method of maintaining line and grade upon approval of the ENGINEER. Prior to approval, the CONTRACTOR shall submit evidence to the ENGINEER that a qualified operator will handle the equipment during the course of construction. When "in the pipe" method is used, grade boards will be required to install the first fifty (50') feet of pipe, and the CONTRACTOR shall check the line and grade at any additional points at which offset stakes have been placed wherever so requested by the ENGINEER. If bending of the beam due to air

temperature variations becomes apparent with "in the pipe" units, a fan shall be provided to circulate the air. However, air velocity shall not be so excessive as to cause pulsating or vibrating of the beam. If, in the opinion of the ENGINEER, the beam cannot be accurately controlled, this method of setting line and grade shall be discontinued. When the aboveground method is used, the set-up shall be checked with three (3) grade boards including one set at the upstream manhole. If the laser has a gradient indicator, two boards may be used to check the set-up. The grade board at the upstream manhole shall be retained to check into as pipe laying progresses.

3.10 Temporary Plugs: At all times when the pipe laying is not actually in progress, the open ends of pipe shall be closed by temporary watertight plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed.

3.11 Final Inspection:

A. Each section of installed sewer will be visually inspected by the ENGINEER prior to final testing. The pipe shall be true to grade, as evidenced by survey report, and shall contain no broken pipe, shall show no leaks, shall show neither obstructions nor the projection of connecting pipes into the main pipe, and shall contain no debris or other deposits which shall in any way reduce the full cross sectional area of the pipe. Pipes shall have alignment tests performed on all mains of twenty-four (24") inch diameter or less. Alignment test shall consist of lamping between manholes or by use of through-the-pipe laser beam pipe laying techniques.

B. Any section of sewer pipe which does not comply with these inspection criteria, as determined by the ENGINEER, shall be promptly corrected, replaced or repaired by the CONTRACTOR at his own expense. Such methods as are employed for the correction shall be approved by the ENGINEER.

3.12 Final Testing:

A. General:

1. When directed by the ENGINEER, the CONTRACTOR shall remove all debris from manholes and shall thoroughly flush sewers preparatory to testing for watertightness and in the case of plastic pipe, for allowable deflections. Sewers, including manhole, constructed under this contract, tested under this section and shall satisfactorily meet the test requirements prior to final acceptance of the work. No exceptions will be permitted from this requirement unless stated in these contract documents or in written orders from the ENGINEER. The CONTRACTOR shall furnish all labor, testing materials and equipment (including plugs and standpipes) etc., shall perform the tests to the satisfaction of the ENGINEER. The CONTRACTOR shall make his own arrangements for water. See Specification Section 03500 - Temporary Facilities.

2. Leakage and pressure tests shall be conducted in the presence of the ENGINEER and in accordance with approved methods as specified herein.

B. Leakage Testing of Completed Gravity Sewer Installations:

1. General:

a. Leakage tests of installed gravity sewers shall be performed after backfill and compaction in the presence of the ENGINEER and at the ENGINEER'S direction. Each section of completed sewer shall be tested by approved methods of infiltration and/or exfiltration testing as described herein. Exfiltration tests may be performed hydrostatically or by low-pressure air.

b. Each isolated sewer test section shall include the run of main sewer between two manholes, the service materials leading to this main sewer, and the upstream manhole. In computing leakage, manholes shall be considered as sections of 48-inch or 60-inch diameter pipe, four (4") feet long, depending on the diameter manhole included in the test. Where consecutive manholes are greater than 150 feet apart on the average, their effect may be ignored in the computation of leakage.

2. Infiltration Tests: Infiltration testing of sewer pipe shall be performed when the groundwater level is above the crown of the pipe at the upper end of the section to be tested. This upper end shall be plugged and a V-notch weir, or other device approved by the ENGINEER, of appropriate size shall be fitted into the lower end in such a manner as to prevent leakage around the weir plate. Commercially manufactured weirs made and calibrated for this purpose shall be used.

3. Exfiltration Tests:

a. Exfiltration testing shall be conducted when the groundwater is below the crown of the pipe at the upper end of the section to be tested. The section of sewer to be tested shall be isolated by plugging the inlet pipe(s) of the upper manhole and the inlet pipe of the lower manhole. The line shall then be filled with water to a level four (4') feet above the crown of the outlet pipe of the upper manhole. Before any measurements are made, a period of two (2) hours shall be permitted to elapse to allow for absorption and escape of trapped air. Following this, a test period of at least four (4) hours shall begin. At the end of the test period, loss of water shall be measured and leakage computed therefrom.

b. Low pressure air tests may be employed as an alternative to water exfiltration tests.

4. Performance Standards:

a. Sewer pipe installations shall be considered free from breakage or significant leakage when tested according to specified procedures and the test results meet the following requirements:

i. Hydrostatic Tests: Rate of infiltration or exfiltration shall not exceed 200 gallons per day per inch of pipe (nominal) diameter per mile of sewer.

ii. Air Tests: After a manhole to manhole reach of pipe has been backfilled, cleaned and services installed, air tight plugs shall be placed in the line at each manhole. Testing shall conform to UNI-B-6. Testing shall be performed for a 1.0 psig pressure loss.

b. If leakage exceeds the criteria, established in the UNI-BELL Specification, the CONTRACTOR, at his own expense, shall make the necessary repairs or replacements required to reduce permanently the leakage to within the specified limits. Testing shall be repeated until the leakage requirements are met.

C. Deflection Testing of Completed Gravity Sewer Installations:

1. General: Deflection tests shall be performed on gravity sewers constructed of materials subject to deflection, such as but not limited to; plastic, PVC, ABS or PVC composite, etc. a minimum of thirty (30) days after backfill and compaction in the presence of the ENGINEER at the ENGINEER'S direction. Each section of completed sewer shall be tested by approved methods of deflection testing as described herein.

2. Go, No-Go Deflection Testing:

a. This test is conducted by pulling a pointed mandrel through the pipe. The mandrel(s) may be constructed by the CONTRACTOR to the specifications of the ENGINEER as detailed at the end of this section. Mandrel diameter shall be 95% of pipe inside diameter. No additional payment will be made to the CONTRACTOR for obtaining testing equipment.

b. The Go, No-Go deflection test will be performed as follows:

i. Completely flush the line making sure the pipe is clean of mud or trash that would hinder the passage of mandrel.

ii. During the final flushing of the line attach a floating block or ball to the end of the mandrel pull rope and float the rope through the line.

iii. After the rope is threaded through the line, connect the pull rope to the mandrel and place the mandrel in the entrance of the pipe.

iv. Connect a second rope to the back of the mandrel. This will enable retrieval of the mandrel if a blockage is encountered.

v. Remove all the slack in the pull rope by gently pulling the rope at the far manhole. After the slack has been removed, place a tape marker on the rope close to the pipe where the mandrel will exit. If mandrel encounters blockage, the marker will provide a means of measuring the travel distance of the mandrel so that the restricted areas can be located.

vi. Draw mandrel through the sewer line. Powered mechanical pulling equipment shall not be used. An increasing resistance to pull is an indication of excessive deflection. If this occurs, measure beginning at marker on rope the distance of manhole. Locate section and replace bedding or pipe if visual examination reveals damage.

vii. Retest.

3. Deflection Measuring Devices:

a. Alternately, final deflection testing of gravity sewers may be performed by the CONTRACTOR utilizing special equipment specifically designed to measure the actual sewer deflections such as an electromechanical deflection probe. Any such equipment must be approved by the ENGINEER, prior to testing.

b. Testing of gravity sewers with deflection measuring devices will conform with the procedures specified in Paragraph b.ii above.

4. Test Rejection: Should the result of any test fail to meet the criteria established in this Specification, the CONTRACTOR shall, at his own expense, locate and repair the rejected section and retest until it is within the specified allowance.

5. Maximum Allowable Deflection: The maximum allowable deflection for gravity sewer pipe materials subject to deflection shall not exceed five (5) percent.

3.13 Records: CONTRACTOR to complete "Utility Valve Record" and "Utility Pipe Data Sheet" for all valves and pipes. Forms are attached to this Section.

3.14 Boring and Jacking: Refer to Section 07170 – Boring and Jacking – Casing, Pipe and Service Tubing.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Sewer Cleanout Assembly:

A. Measurement: Sewer cleanout assembly, including 4" and 6", including connection couplings, C.I. combination wye, PVC riser, sewer spigot by C.I. hub, C.I. frame and cap, etc., and including all work, labor, materials, tools, equipment and

incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Each installed, tested and accepted.

B. Payment: Sewer cleanout assembly, measured as provided above, will be paid at the Contract unit price per Each for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and all approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere)(Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere)(Pavement Repair or Replacement Paid Elsewhere)(Select Backfill Paid Elsewhere)(Traffic Control Paid Elsewhere) (Bedding and/or Foundation Paid Elsewhere).

C. Pay Items:

Sewer Service House Stacks (05110)(01) per Each

4.2 8" Gravity Sewer Pipe:

A. Measurement: 8" gravity sewer pipe, of the various depths, including excavation and native backfill, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per the Linear Foot installed, tested and accepted.

B. Payment: 8" gravity sewer pipe, measured as provided above, will be paid at the Contract unit price per Linear Foot for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere)(Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere) (Pavement Repair or Replacement Paid Elsewhere) (Select Backfill Paid Elsewhere)(Traffic Control Paid Elsewhere) (Bedding and/or Foundation Paid Elsewhere).

C. Pay Items:

15" SDR 26 Gravity Sewer Pipe (0-6 Feet Deep) (05110)(02) per Linear Foot

15" SDR 26 Gravity Sewer Pipe (6-8 Feet Deep) (05110)(03) per Linear Foot

15" SDR 26 Gravity Sewer Pipe (8-10 Feet Deep) (05110)(04) per Linear Foot

15" SDR 26 Gravity Sewer Pipe (10-12 Feet Deep) (05110)(05) per Linear Foot

15" SDR 26 Gravity Sewer Pipe (12-14 Feet Deep) (05110)(06) per Linear Foot

15" SDR 26 Gravity Sewer Pipe (14-16 Feet Deep) (05110)(07) per Linear Foot

12" SDR 26 Gravity Sewer Pipe (0-6 Feet Deep) (05110)(08) per Linear Foot

12" SDR 26 Gravity Sewer Pipe (6-8 Feet Deep) (05110)(09) per Linear Foot

12" SDR 26 Gravity Sewer Pipe (8-10 Feet Deep) (05110)(10) per Linear Foot

12" SDR 26 Gravity Sewer Pipe (10-12 Feet Deep) (05110)(11) per Linear Foot

12" SDR 26 Gravity Sewer Pipe (12-14 Feet Deep) (05110)(12) per Linear Foot

12" SDR 26 Gravity Sewer Pipe (14-16 Feet Deep) (05110)(13) per Linear Foot

10" SDR 26 Gravity Sewer Pipe (0-6 Feet Deep) (05110)(14) per Linear Foot

10" SDR 26 Gravity Sewer Pipe (6-8 Feet Deep) (05110)(15) per Linear Foot

10" SDR 26 Gravity Sewer Pipe (8-10 Feet Deep) (05110)(16) per Linear Foot

10" SDR 26 Gravity Sewer Pipe (10-12 Feet Deep) (05110)(17) per Linear Foot

10" SDR 26 Gravity Sewer Pipe (12-14 Feet Deep) (05110)(18) per Linear Foot

10" SDR 26 Gravity Sewer Pipe (14-16 Feet Deep) (05110)(19) per Linear Foot

8" SDR 26 Gravity Sewer Pipe (0-6 Feet Deep) (05110)(20) per Linear Foot

8" SDR 26 Gravity Sewer Pipe (6-8 Feet Deep) (05110)(21) per Linear Foot

8" SDR 26 Gravity Sewer Pipe (8-10 Feet Deep) (05110)(22) per Linear Foot

8" SDR 26 Gravity Sewer Pipe (10-12 Feet Deep) (05110)(23) per Linear Foot

8" SDR 26 Gravity Sewer Pipe (12-14 Feet Deep) (05110)(24) per Linear Foot

8" SDR 26 Gravity Sewer Pipe (14-16 Feet Deep) (05110)(25) per Linear Foot

6" SDR 26 Gravity Sewer Pipe (0-6 Feet Deep) (05110)(26) per Linear Foot

4" SDR 26 Gravity Sewer Pipe (0-6 Feet Deep) (05110)(27) per Linear Foot

4" SDR 26 Gravity Sewer Pipe (Type B) (Cradle) (05110)(28) per Linear Foot

6" SDR 26 Gravity Sewer Pipe (Type B) (Cradle) (05110)(29) per Linear Foot

4.3 Gravity Sewer Fittings:

A. Measurement: Gravity sewer fittings, of the various types and sizes, including excavation and native backfill, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Each installed and accepted.

B. Payment: Gravity sewer fittings, measured as provided above, will be paid at the Contract unit price per Each for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and all approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere)(Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere) (Pavement Repair or Replacement Paid Elsewhere) (Select Backfill Paid Elsewhere)(Traffic Control Paid Elsewhere) (Bedding and/or Foundation Paid Elsewhere)

C. Pay Items:

15" x 6" Wye (05110)(30) per Each

15" x 4" Wye (051100)(31) per Each

12" x 6" Wye (05110)(32) per Each

12" x 4" Wye (051100)(33) per Each

10" x 6" Wye (05110)(34) per Each

10" x 4" Wye (051100)(35) per Each

8" x 6" Wye (05110)(36) per Each

8" x 4" Wye (051100)(37) per Each

6" x 6" Wye (05110)(38) per Each

6" x 4" Wye (05110)(39) per Each

15" 45° Bend (05110)(40) per Each

12" 45° Bend (05110)(41) per Each

10" 45° Bend (05110)(42) per Each

8" 45° Bend (05110)(43) per Each

6" 45° Bend (05110)(44) per Each

4" 45° Bend (05110)(45) per Each

4.4 Connect New Gravity Sewer to Existing Sewer Manhole:

A. Measurement: Connect new gravity sewer to existing sewer manholes, of the various sizes and depths, including sidewall demo, flexible neoprene manhole boot, non-shrink cement grout, couplings, flexible adapters, etc, including excavation and native backfill, and including all work, labor, materials, tools, equipment and incidentals

required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Each installed, and accepted.

B. Payment: Connect new gravity sewer to existing sewer manholes, measured as provided above, will be paid at the Contract unit price per Each for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere)(Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere) (Pavement Repair or Replacement Paid Elsewhere)(Select Backfill Paid Elsewhere)(Traffic Control Paid Elsewhere)(Bedding and/or Foundation Paid Elsewhere).

C. Pay Item:

Connect New 4" Gravity Sewer to Existing Sewer Manhole (0'-6' Deep)(05110)(46) per Each

Connect New 4" Gravity Sewer to Existing Sewer Manhole (6'-8' Deep)(05110)(47) per Each

Connect New 4" Gravity Sewer to Existing Sewer Manhole (8'-10' Deep)(05110)(48) per Each

Connect New 4" Gravity Sewer to Existing Sewer Manhole (10'-12' Deep)(05110)(49) per Each

Connect New 4" Gravity Sewer to Existing Sewer Manhole (12'-14' Deep)(0511005110)(50) per Each

Connect New 4" Gravity Sewer to Existing Sewer Manhole (14'-16' Deep)(05110)(51) per Each

Connect New 6" Gravity Sewer to Existing Sewer Manhole (0'-6' Deep)(05110)(52) per Each

Connect New 6" Gravity Sewer to Existing Sewer Manhole (6'-8' Deep)(05110)(53) per Each

Connect New 6" Gravity Sewer to Existing Sewer Manhole (8'-10' Deep)(05110)(54) per Each

Connect New 6" Gravity Sewer to Existing Sewer Manhole (10'-12' Deep)(05110)(55) per Each

Connect New 6" Gravity Sewer to Existing Sewer Manhole (12'-14' Deep)(05110)(56) per Each

Connect New 6" Gravity Sewer to Existing Sewer Manhole (14'-16' Deep)(05110)(57) per Each

Connect New 8" Gravity Sewer to Existing Sewer Manhole (0'-6' Deep)(05110)(58) per Each

Connect New 8" Gravity Sewer to Existing Sewer Manhole (6'-8' Deep)(05110)(59) per Each

Connect New 8" Gravity Sewer to Existing Sewer Manhole (8'-10' Deep)(05110)(60) per Each

Connect New 8" Gravity Sewer to Existing Sewer Manhole (10'-12' Deep)(05110)(61) per Each

Connect New 8" Gravity Sewer to Existing Sewer Manhole (12'-14' Deep)(05110)(62) per Each

Connect New 8" Gravity Sewer to Existing Sewer Manhole (14'-16' Deep)(05110)(63) per Each

Connect New 10" Gravity Sewer to Existing Sewer Manhole (0'-6' Deep)(05110)(64) per Each

Connect New 10" Gravity Sewer to Existing Sewer Manhole (6'-8' Deep)(05110)(65) per Each

Connect New 10" Gravity Sewer to Existing Sewer Manhole (8'-10' Deep)(05110)(66) per Each

Connect New 10" Gravity Sewer to Existing Sewer Manhole (10'-12' Deep)(05110)(67) per Each

Connect New 10" Gravity Sewer to Existing Sewer Manhole (12'-14' Deep)(05110)(68) per Each

Connect New 10" Gravity Sewer to Existing Sewer Manhole (14'-16' Deep)(05110)(69) per Each

Connect New 12" Gravity Sewer to Existing Sewer Manhole (0'-6' Deep)(05110)(70) per Each

Connect New 12" Gravity Sewer to Existing Sewer Manhole (6'-8' Deep)(05110)(71) per Each

Connect New 12" Gravity Sewer to Existing Sewer Manhole (8'-10' Deep)(05110)(72) per Each

Connect New 12" Gravity Sewer to Existing Sewer Manhole (10'-12' Deep)(05110)(73) per Each

Connect New 12" Gravity Sewer to Existing Sewer Manhole (12'-14' Deep)(05110)(74) per Each

Connect New 12" Gravity Sewer to Existing Sewer Manhole (14'-16' Deep)(05110)(75) per Each

Connect New 15" Gravity Sewer to Existing Sewer Manhole (0'-6' Deep)(05110)(76) per Each

Connect New 15" Gravity Sewer to Existing Sewer Manhole (6'-8' Deep)(05110)(77) per Each

Connect New 15" Gravity Sewer to Existing Sewer Manhole (8'-10' Deep)(05110)(78) per Each

Connect New 15" Gravity Sewer to Existing Sewer Manhole (10'-12' Deep)(05110)(79) per Each

Connect New 15" Gravity Sewer to Existing Sewer Manhole (12'-14' Deep)(05110)(80) per Each

Connect New 15" Gravity Sewer to Existing Sewer Manhole (14'-16' Deep)(05110)(81) per Each

4.5 Connect New Gravity Sewer to Existing Gravity Sewer:

A. Measurement: Connect new gravity sewer to existing gravity sewer, of the various sizes, including line cutting, fittings, adapters, etc., excavation and native backfill, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Each installed and accepted.

B. Payment: Connect new gravity sewer to existing gravity sewer, measured as provided above, will be paid at the Contract unit price per Each for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere)(Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere) (Pavement Repair or Replacement Paid Elsewhere)(Select Backfill Paid Elsewhere)(Traffic Control Paid Elsewhere).

C. Pay Item:

Connect New 15" Gravity Sewer to Existing 15" Gravity Sewer (0'-6' Deep) (05110)(82) per Each

Connect New 15" Gravity Sewer to Existing 15" Gravity Sewer (6'-8' Deep) (05110)(83) per Each

Connect New 15" Gravity Sewer to Existing 15" Gravity Sewer (8'-10' Deep) (05110)(84) per Each

Connect New 15" Gravity Sewer to Existing 15" Gravity Sewer (10'-12' Deep) (05110)(85) per Each

Connect New 15" Gravity Sewer to Existing 15" Gravity Sewer (12'-14' Deep) (05110)(86) per Each

Connect New 15" Gravity Sewer to Existing 15" Gravity Sewer (14'-16' Deep) (05110)(87) per Each

Connect New 12" Gravity Sewer to Existing 12" Gravity Sewer (0'-6' Deep) (05110)(88) per Each

Connect New 12" Gravity Sewer to Existing 12" Gravity Sewer (6'-8' Deep) (05110)(89) per Each

Connect New 12" Gravity Sewer to Existing 12" Gravity Sewer (8'-10' Deep) (05110)(90) per Each

Connect New 12" Gravity Sewer to Existing 12" Gravity Sewer (10'-12' Deep) (05110)(91) per Each

Connect New 12" Gravity Sewer to Existing 12" Gravity Sewer (12'-14' Deep) (05110)(92) per Each

Connect New 12" Gravity Sewer to Existing 12" Gravity Sewer (14'-16' Deep) (05110)(93) per Each

Connect New 12" Gravity Sewer to Existing 15" Gravity Sewer (0'-6' Deep) (05110)(94) per Each

Connect New 12" Gravity Sewer to Existing 15" Gravity Sewer (6'-8' Deep) (05110)(95) per Each

Connect New 12" Gravity Sewer to Existing 15" Gravity Sewer (8'-10' Deep) (05110)(96) per Each

Connect New 12" Gravity Sewer to Existing 15" Gravity Sewer (10'-12' Deep) (05110)(97) per Each

Connect New 12" Gravity Sewer to Existing 15" Gravity Sewer (12'-14' Deep) (05110)(98) per Each

Connect New 12" Gravity Sewer to Existing 15" Gravity Sewer (14'-16' Deep) (05110)(99) per Each

Connect New 10" Gravity Sewer to Existing 10" Gravity Sewer (0'-6' Deep) (05110)(100) per Each

Connect New 10" Gravity Sewer to Existing 10" Gravity Sewer (6'-8' Deep) (05110)(101) per Each

Connect New 10" Gravity Sewer to Existing 10" Gravity Sewer (8'-10' Deep) (05110)(102) per Each

Connect New 10" Gravity Sewer to Existing 10" Gravity Sewer (10'-12' Deep) (05110)(103) per Each

Connect New 10" Gravity Sewer to Existing 10" Gravity Sewer (12'-14' Deep) (05110)(104) per Each

Connect New 10" Gravity Sewer to Existing 10" Gravity Sewer (14'-16' Deep) (05110)(105) per Each

Connect New 10" Gravity Sewer to Existing 12" Gravity Sewer (0'-6' Deep) (05110)(106) per Each

Connect New 10" Gravity Sewer to Existing 12" Gravity Sewer (6'-8' Deep) (05110)(107) per Each

Connect New 10" Gravity Sewer to Existing 12" Gravity Sewer (8'-10' Deep) (05110)(108) per Each

Connect New 10" Gravity Sewer to Existing 12" Gravity Sewer (10'-12' Deep) (05110)(109) per Each

Connect New 10" Gravity Sewer to Existing 12" Gravity Sewer (12'-14' Deep) (05110)(110) per Each

Connect New 10" Gravity Sewer to Existing 12" Gravity Sewer (14'-16' Deep) (05110)(111) per Each

Connect New 10" Gravity Sewer to Existing 15" Gravity Sewer (0'-6' Deep) (05110)(112) per Each

Connect New 10" Gravity Sewer to Existing 15" Gravity Sewer (6'-8' Deep) (05110)(113) per Each

Connect New 10" Gravity Sewer to Existing 15" Gravity Sewer (8'-10' Deep) (05110)(114) per Each

Connect New 10" Gravity Sewer to Existing 15" Gravity Sewer (10'-12' Deep) (05110)(115) per Each

Connect New 10" Gravity Sewer to Existing 15" Gravity Sewer (12'-14' Deep) (05110)(116) per Each

Connect New 10" Gravity Sewer to Existing 15" Gravity Sewer (14'-16' Deep) (05110)(117) per Each

Connect New 8" Gravity Sewer to Existing 8" Gravity Sewer (0'-6' Deep) (05110)(118) per Each

Connect New 8" Gravity Sewer to Existing 8" Gravity Sewer (6'-8' Deep) (05110)(119) per Each

Connect New 8" Gravity Sewer to Existing 8" Gravity Sewer (8'-10' Deep) (05110)(120) per Each

Connect New 8" Gravity Sewer to Existing 8" Gravity Sewer (10'-12' Deep) (05110)(121) per Each

Connect New 8" Gravity Sewer to Existing 8" Gravity Sewer (12'-14' Deep) (05110)(122) per Each

Connect New 8" Gravity Sewer to Existing 8" Gravity Sewer (14'-16' Deep) (05110)(123) per Each

Connect New 8" Gravity Sewer to Existing 10" Gravity Sewer (0'-6' Deep) (05110)(124) per Each

Connect New 8" Gravity Sewer to Existing 10" Gravity Sewer (6'-8' Deep) (05110)(125) per Each

Connect New 8" Gravity Sewer to Existing 10" Gravity Sewer (8'-10' Deep) (05110)(126) per Each

Connect New 8" Gravity Sewer to Existing 10" Gravity Sewer (10'-12' Deep) (05110)(127) per Each

Connect New 8" Gravity Sewer to Existing 10" Gravity Sewer (12'-14' Deep) (05110)(128) per Each

Connect New 8" Gravity Sewer to Existing 10" Gravity Sewer (14'-16' Deep) (05110)(129) per Each

Connect New 8" Gravity Sewer to Existing 12" Gravity Sewer (0'-6' Deep) (05110)(130) per Each

Connect New 8" Gravity Sewer to Existing 12" Gravity Sewer (6'-8' Deep) (05110)(131) per Each

Connect New 8" Gravity Sewer to Existing 12" Gravity Sewer (8'-10' Deep) (05110)(132) per Each

Connect New 8" Gravity Sewer to Existing 12" Gravity Sewer (10'-12' Deep) (05110)(133) per Each

Connect New 8" Gravity Sewer to Existing 12" Gravity Sewer (12'-14' Deep) (05110)(134) per Each

Connect New 8" Gravity Sewer to Existing 12" Gravity Sewer (14'-16' Deep) (05110)(135) per Each

Connect New 8" Gravity Sewer to Existing 15" Gravity Sewer (0'-6' Deep) (05110)(136) per Each

Connect New 8" Gravity Sewer to Existing 15" Gravity Sewer (6'-8' Deep) (05110)(137) per Each

Connect New 8" Gravity Sewer to Existing 15" Gravity Sewer (8'-10' Deep) (05110)(138) per Each

Connect New 8" Gravity Sewer to Existing 15" Gravity Sewer (10'-12' Deep) (05110)(139) per Each

Connect New 8" Gravity Sewer to Existing 15" Gravity Sewer (12'-14' Deep) (05110)(140) per Each

Connect New 8" Gravity Sewer to Existing 15" Gravity Sewer (14'-16' Deep) (05110)(141) per Each

Connect New 6" Gravity Sewer to Existing 8" Gravity Sewer (0'-6' Deep) (05110)(142) per Each

Connect New 6" Gravity Sewer to Existing 8" Gravity Sewer (6'-8' Deep) (05110)(143) per Each

Connect New 6" Gravity Sewer to Existing 8" Gravity Sewer (8'-10' Deep) (05110)(144) per Each

Connect New 6" Gravity Sewer to Existing 8" Gravity Sewer (10'-12' Deep) (05110)(145) per Each

Connect New 6" Gravity Sewer to Existing 8" Gravity Sewer (12'-14' Deep) (05110)(146) per Each

Connect New 6" Gravity Sewer to Existing 8" Gravity Sewer (14'-16' Deep) (05110)(147) per Each

Connect New 6" Gravity Sewer to Existing 6" Gravity Sewer (0'-6' Deep) (05110)(148) per Each

Connect New 6" Gravity Sewer to Existing 6" Gravity Sewer (6'-8' Deep) (05110)(149) per Each

Connect New 6" Gravity Sewer to Existing 6" Gravity Sewer (8'-10' Deep) (05110)(150) per Each

Connect New 6" Gravity Sewer to Existing 6" Gravity Sewer (10'-12' Deep) (05110)(151) per Each

Connect New 6" Gravity Sewer to Existing 6" Gravity Sewer (12'-14' Deep) (05110)(152) per Each

Connect New 6" Gravity Sewer to Existing 6" Gravity Sewer (14'-16' Deep) (05110)(153) per Each

Connect New 4" Gravity Sewer to Existing 8" Gravity Sewer (0'-6' Deep) (05110)(154) per Each

Connect New 4" Gravity Sewer to Existing 8" Gravity Sewer (6'-8' Deep) (05110)(155) per Each

Connect New 4" Gravity Sewer to Existing 8" Gravity Sewer (8'-10' Deep) (05110)(156) per Each

Connect New 4" Gravity Sewer to Existing 8" Gravity Sewer (10'-12' Deep) (05110)(157) per Each

Connect New 4" Gravity Sewer to Existing 8" Gravity Sewer (12'-14' Deep) (05110)(158) per Each

Connect New 4" Gravity Sewer to Existing 8" Gravity Sewer (14'-16' Deep) (05110)(159) per Each

Connect New 4" Gravity Sewer to Existing 6" Gravity Sewer (0'-6' Deep) (05110)(160) per Each

Connect New 4" Gravity Sewer to Existing 6" Gravity Sewer (6'-8' Deep) (05110)(161) per Each

Connect New 4" Gravity Sewer to Existing 6" Gravity Sewer (8'-10' Deep) (05110)(162) per Each

Connect New 4" Gravity Sewer to Existing 6" Gravity Sewer (10'-12' Deep) (05110)(163) per Each

Connect New 4" Gravity Sewer to Existing 6" Gravity Sewer (12'-14' Deep) (05110)(164) per Each

Connect New 4" Gravity Sewer to Existing 6" Gravity Sewer (14'-16' Deep) (05110)(165) per Each

Connect New 4" Gravity Sewer to Existing 4" Gravity Sewer (0'-6' Deep) (05110)(166) per Each

Connect New 4" Gravity Sewer to Existing 4" Gravity Sewer (6'-8' Deep) (05110)(167) per Each

Connect New 4" Gravity Sewer to Existing 4" Gravity Sewer (8'-10' Deep) (05110)(168) per Each

Connect New 4" Gravity Sewer to Existing 4" Gravity Sewer (10'-12' Deep) (05110)(169) per Each

Connect New 4" Gravity Sewer to Existing 4" Gravity Sewer (12'-14' Deep) (05110)(170) per Each

Connect New 4" Gravity Sewer to Existing 4" Gravity Sewer (14'-16' Deep) (05110)(171) per Each

Reconnect Existing 4"-6" Service to New PE Main (0'-8' Deep) (05110)(172) per Each

Reconnect Existing 4"-6" Service to New PE Main (8'-12' Deep) (05110)(173) per Each

Reconnect Existing 4"-6" Service to New PE Main (12'-16' Deep) (05110)(174) per Each

4.6 Gravity Sewer Main Testing:

A. Measurement: Gravity sewer main testing, including infiltration and exfiltration, deflection testing, lamping, mandrel test, etc., including excavation and native backfill, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Linear Foot performed and accepted.

B. Payment: Gravity sewer main testing, measured as provided above, will be paid at the Contract unit price per Linear Foot for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all

approved and acceptable practices.

C. Pay Item: Gravity Sewer Main Testing (05110)(175) per Linear Foot.

SECTION 05110 – BORING AND JACKING – PIPE AND SERVICE TUBING
REFERENCE - NO PAY ITEM: *Install Pipe by Boring Method: (Refer to Section 04120 – Water Distribution System and Related Appurtenances.*

(See "Utility Valve Record" Attached)

(See "Utility Pipe Data Sheet" Attached)

- END OF SECTION -

UTILITY VALVE RECORD

Contents to be handled: _____ gas – water – sewer _____
(circle one)

Location/address: _____

_____

_____

_____

Size: _____ Make: _____ Type: _____

Valve pressure rating: _____ Gearing: _____

By-pass: _ yes/no __ Size and type of By-pass valve: _____
(circle one)

Opens: Clockwise/Counter-clockwise Turns to operate: _____
(circle one)

Set in: _____

Depth to operating nut: _____

Remarks/Comments: _____

_____

_____

_____

_____

Date of installation: _____ Contractor: _____

Sketch of valve location:

UTILITY PIPE DATA SHEET

Project Name: _____

Date of Installation: _____ Contractor: _____

Location & Description of Project:

_____

_____

_____

_____

_____

_____

DATA	CARRIER PIPE	CASING (if used)
Contents to be handled (water, gas, sewer)		
Pipe Material		
Specification & Grade of Pipe		
Outside Diameter		
Wall Thickness		
Yield Strength (PSI)		
Maximum allowable operating pressure (PSIG)		
Type of Joint (welded, mechanical, butt-fused)		
Method of installation (bore, open cut)		
Average depth of pipe		
Coating material		
Cathodic protection		
Length of pipe		

SECTION 05120

SANITARY SEWER MANHOLES

PART 1 - GENERAL

1.1 Scope: This Section covers NEW sanitary sewer manholes to be installed on the project.

1.2 Applicable Publications: The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.

American Society for Testing and Materials (ASTM) Publications:

A48	Specification for Gray Iron Casting
A167	Stainless and Heat Resisting Chromium Nickel Steel Plate Sheet and Strip
C55	Concrete Building Brick
C150	Portland Cement
C443	"O" Ring Gasket for Precast Pipe
C478	Precast Reinforced Concrete Manhole Sections
C827	Test Method for Early Volume Change of Cementitous Mixtures
C923	Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes

1.3 Submittals: Submittals shall be provided in accordance with Section 03340 - Shop Drawings, Samples and Project Data.

1.4 Inspection:

A. The quality of all materials, the process of manufacture, and the finished pre-cast sections shall be subject to inspection and approval by the ENGINEER, or other representatives of the OWNER. Such inspection may be made at the site after delivery. The sections shall be subject to rejection at any time on account of failure to meet any of the Specification requirements. Sections rejected after delivery to the job shall be marked for identification and shall be removed from the job at once. All sections which have been damaged after delivery will be rejected, and if already installed, shall be acceptably repaired, if permitted, or removed and replaced at no additional expense to the OWNER.

B. At the time of inspection, the sections will be carefully examined for compliance with the ASTM designation specified and these Specifications. All sections shall be inspected for general appearance, dimension, "scratch-strength", blisters, cracks, roughness, soundness, etc. The surface shall be dense and close-textured.

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

D. Precast manhole sections shall be lifted and moved by use of suitable lifting slings, plugs and holes so as not to damage the manhole lip or edges.

E. Sewer brick shall be kept clean and dry.

F. Manhole joints shall be kept protected from damage and shall be kept clean and free of mud, dirt, concrete or other materials that would affect the making of a watertight seal.

G. All damage to precast sections that is not cause for rejection shall be repaired. Repair and patching of minor breaks shall be done by chipping and scarifying the defective area before application of grout. Sufficient time shall be allowed for curing before precast sections are installed.

PART 2 - PRODUCTS

2.1 Precast Concrete Sections: Precast concrete manhole base, riser and eccentric top sections shall conform to the Specifications for Precast Reinforced Concrete Manhole Sections, ASTM Designation C478, except as otherwise specified below. The method of construction shall conform to the Drawings and the following additional requirements.

A. The minimum wall thickness for the various manhole sections shall be as listed below:

Inside Diameter of Barrel	Minimum Wall Thickness
48-inch	5-inch
60-inch	5-inch
72-inch	6-inch
96-inch	8-inch
120-inch	10-inch

B. Manhole sections shall have tongue and groove joints. Joints shall have round rubber gaskets set in specially provided indentations. The round rubber "O"-ring gasket shall conform to ASTM C443 standard Specifications.

C. At the time of batching, incorporate into the precast concrete manholes Xypex Admix C-1000R at a rate of 3.5% by weight of cement, or approved equal. Admixture shall be added in accordance with manufacturer's written instructions.

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

E. Section shall be cured by an approved method and shall not be shipped until at least five (5) days after having been fabricated.

F. Top sections shall be eccentric cone sections except that flat slab tops shall be used where cover over the top of the pipe is less than four (4) feet. Concentric cones are not acceptable.

G. Precast flat slab top sections, where required, shall be capable of supporting the overburden plus a live load equivalent to AASHTO H-20 loading.

H. The tops of bases shall be suitably shaped to mate with the precast riser section.

I. Precast bottoms shall have a thickness of eight (8") inches for depths under twelve (12') feet and twelve (12") inches for depths twelve (12') feet and over.

J. Precast base sections shall be integrally cast and shall consist of manhole bottom and walls which shall extend a minimum of six (6") inches above the top of the highest inflowing sewer. The top of the base section shall be carefully formed to receive the tongue of the barrel section. There shall be a minimum distance of four (4") inches between the invert of the lowest outflowing sewer and floor of the precast base to provide for the construction of a formed invert and bench wall within the manhole. No more than two liftholes shall be cast in the bases. Manholes four (4') feet in diameter shall have a bottom at least eight (8") inches thick for depths under twelve (12') feet and twelve (12") inches thick for depths twelve (12') feet greater and a wall at least five (5") inches thick.

K. Openings in precast sections shall be cut with an appropriate drill, saw or blade or shall be formed during the molding or casting process and shall be round, smooth and true. Openings made by jackhammering, chipping or breaking will not be permitted.

L. Where the difference in elevation between the new incoming sewer and the existing outgoing sewer is greater than two (2) feet, a drop inlet connection shall be constructed as shown on the Drawings. Any visible leakage shall be sealed and repaired by the Contractor prior to acceptance.

2.2 Cast-In-Place Bases: The bases shall be constructed of cast-in-place reinforced concrete, and consist of manhole bottom including the shaped invert and walls which shall extend a minimum of six (6") inches above the top of the highest inflowing sewer. Manhole bases including bottoms, inverts and walls shall be formed in standard metal forms designed specifically for this use. The concrete to be used shall be Class A with a minimum average 28-day compressive strength of 3,800 psi.

2.3 Infiltration Control

A. Flexible Neoprene Infiltration Boot: Opening in manhole bases for pipe main connections shall utilize flexible neoprene boot, mechanically clamped to the manhole and to the pipe to provide a water-tight seal which will accommodate pipe deflection of 20° in all directions and a head pressure of 10 psi. Gaskets shall conform to requirement of ASTM C-923. The boot shall be as manufactured by Kor-N-Seal, A-Lok or approved equal.

B. Manhole Water Stops: Connections to existing manholes shall utilize a flexible elastomeric plastic Concrete Manhole Adapter (Water Stop) to eliminate leaks around pipe entering manhole walls. The water stop/adapter shall be manufactured by Fernco, Press-Seal Gasket Corporation, or approved equal.

2.4 Brick Masonry: Brick used for inverts and construction of the top of the manhole shall be whole 2" x 4" x 8" brick and comply with ASTM C55, Grade SW. Bricks shall be placed with a cement mortar having one part Portland Cement ASTM C150 Type 1, 2 parts of mortar sand, and water clean and free from injurious matter. The inside and outside surfaces shall be neatly plastered with at least one-half (½") inch of mortar.

2.5 Spacer Rings: Spacer rings used to adjust the top of the manhole to final grade shall be precast concrete rings furnished the manhole manufacturer or cast iron rings approved by the ENGINEER.

A. Precast Concrete: New precast concrete riser rings, free from cracks, voids and other defects, shall conform to ASTM C478. Contractor shall use precast concrete riser rings of a nominal thickness of not less than four (4) inches and not more than six (6) inches for reconstruction and/or adjustment of the manhole frame and cover.

B. Cast Iron: New cast iron riser rings shall be of domestic origin, conform to the latest edition of AASHTO M306, and designed for H-20 traffic load rating. Contractor shall use cast iron riser rings for reconstruction and/or adjustment of the manhole frame and cover of less than 4 inches.

2.6 Manhole Steps: Manhole steps will not be installed in manholes constructed under this contract.

2.7 Foundation Material: Refer to Section 07280 – Bedding; Type C and/or R as directed.

2.8 Manhole Covers and Frames:

A. All castings for manhole covers and frames and other purposes shall be close grained, tough, gray iron free from cracks, holes, swells and cold spots. The quality shall be such that a blow from a hammer will produce an indentation on a rectangular edge of the casting without flaking the metal. All manhole castings shall be made accurately to the pattern and to the dimensions specified with carefully machined bearing surfaces.

B. Allowances shall be made in the patterns so that specified thicknesses shall not be reduced. All lids which "rock" and do not lie solid after construction is finished shall be

rejected and shall be replaced by adequate lids. No plugging, burning-in or filing will be allowed. Covers shall fit the frames in any position. All castings shall be carefully coated, both inside and out, with coal tar pitch varnish. The varnish shall be made from a good quality of coal tar, with sufficient oil added to make a smooth coating, tough and tenacious when cold, and not brittle nor with any tendency to scale off.

C. The total weight of each manhole cover and frame shall not be less than 430 pounds. The opening inside diameter shall be twenty-two and one-half (22½) inches and the minimum total height shall be eight and one-half (8½) inches and shall be No. V-2358-WT as manufactured by Vulcan Foundry, East Jordan Iron Works, or approved equal.

D. Weight and dimensional tolerances shall not exceed those permitted by ASTM Standards. Castings shall be Class 30 conforming to the ASTM Standard Specification for Gray Iron Castings, Designation A48.

E. The cover shall have the word "Sewer" in two (2") inch or larger letters cast into the top surface.

F. All castings shall be thoroughly cleaned and subjected to a careful hammer inspection.

2.9 Non-Shrink Cement Grout: Refer to Section 07330 – Cast-In-Place Concrete; paragraph 2.3; Non-Shrink Cement Grout

PART 3 - EXECUTION

3.1 Installation:

A. Manholes shall be constructed to the dimensions locations and elevations as shown on the Drawings and as specified herein.

B. If the base is cast-in-place concrete, it shall be placed on a thoroughly compacted sub-base of bedding material conforming to Paragraph 2.7 Foundation Material of this Section.

C. Brick shall be clean, unsaturated and surface dry before laying and shall be laid on a full-mortar bed with "push joints". In no event will slushing or grouting of a joint be permitted, nor shall a joint be made by working in mortar after the brick has been laid. Joints between the courses of bricks in manholes and other structures shall be as nearly as possible of a uniform thickness of 3/8 of an inch.

D. The inside and outside of the brick riser sewer structures shall be neatly plastered with mortar ½" thick minimum.

E. Brickwork shall not be laid upon a concrete foundation less than 24 hours after such foundation has been poured. Brickwork shall not be laid in water, nor shall water be allowed to stand or run on any brickwork until the mortar has thoroughly set. Where

new work is joined to existing finished work, the contact surface of the latter shall be thoroughly cleaned and moistened.

F. The manholes shall have an invert channel shaped to correspond to the lower half of the incoming sewer pipe. The top of the shelf created by the invert channel grouting shall be neatly sloped to drain toward the channel.

G. Concrete masonry unit or brick manholes shall be allowed only in writing by the ENGINEER. These manholes will be allowed on an individual case by case basis due to specific site conditions such as placing a manhole over an existing sewer line or other inhibiting conditions not foreseen.

H. Precast concrete structure sections shall be set so as to be vertical and with sections in true alignment within a ¼" maximum tolerance. The outside and inside joint shall be filled with a comparatively dry mortar (one part cement to two parts sand) and finished flush with the adjoining surfaces. Backfilling shall be done in a careful manner bringing the fill up evenly on all sides. If leaks appear in the structures, the inside joints shall be caulked with lead wool to the satisfaction of the ENGINEER. The CONTRACTOR shall install the precast section in a manner that will result in a watertight joint.

I. Holes precast in the manhole sections required for handling or other purposes shall be plugged with nonshrink grout or by grout in combination with concrete plugs.

J. Where holes must be cut in the precast sections to accommodate pipes, cutting shall be done prior to setting them in place to prevent any subsequent jarring which may loosen the mortar joints.

K. In constructing manholes, all ground water shall be kept away from newly grouted pipe and rings or freshly laid brick or concrete work until cement has properly set and until a watertight job is obtained. Manholes which admit ground water after completion shall not be accepted.

3.2 Placement and Alignment:

A. Before pouring a cast-in-place base, the downstream and upstream pipes shall be set to proper grade so that pipe ends will be flush with the inside of the manhole. When placing the precast or pouring the concrete base, manhole foundation materials shall be placed under the base as indicated on the detail Drawing. Foundation material shall be a minimum of six (6") inches deep and shall conform to Paragraph 2.7 - Foundation Material of this Section. Standard metal forms supplied by the manhole manufacturer shall be used for the work in constructing cast-in-place bases. The form shall include a ring at the top to form a groove to receive the first precast riser section.

B. Pipes entering precast sections of manholes shall be set securely in the precast opening at the correct line and grade.

C. Manhole sections shall not be set by wedging or placing shims to secure proper level.

3.3 Joints: The joints between concrete manhole sections shall be sealed with neoprene gaskets or by other approved means to ensure watertightness of the joints. Joint design shall be approved by the ENGINEER.

3.4 Frames and Covers: The frames and covers shall be so set that the top of the cover will be flush with or higher than finished grade as directed by the ENGINEER. Frames shall be set concentric with the top of the masonry and in a full bed of mortar so that the space between the top of the manhole masonry and the bottom flange of the frame shall be completely filled and made watertight. A ring of concrete with reinforcement hoops shall be placed around and on the top of the bottom flange. The concrete shall be smoothly finished and have a slight slope to shed water away from the frame.

3.5 Inverts and Shelves:

A. The invert channel shall be smooth and semi-circular in shape conforming to the inside of the pipe diameter. Changes in direction of flow shall be made with a smooth curve of as large a radius as the size of the manhole will permit. Changes in size and grade of the channels shall be made gradually. The invert shall be formed using concrete or mortar. Half pipe linings shall not be allowed. Where cast-in-place bases are constructed, flow channels and shelve walls shall be monolithically poured with the base.

B. Shelves shall be pitched a minimum of one (1") inch per foot from the inside periphery of the manhole to the edge of the flow channel.

C. CONTRACTOR shall neatly grout infiltration boot and pipe entrances into manholes during manhole invert and bench grouting.

3.6 Testing of Manholes:

A. All pipes and other openings into the manhole shall be suitably plugged and the plugs braced to prevent blow out. The manholes shall be filled with water to the top of the cone section. If the excavation has not been backfilled and observation indicates no visible leakage, that is, no water visibly moving down the surface of the manhole, the manhole may be considered to be satisfactorily watertight. If the test as described above is unsatisfactory as determined by the ENGINEER, or if the manhole excavation has been backfilled, the test shall be continued. A period of time may be permitted, if the CONTRACTOR so wishes, to allow for absorption. At the end of this period, the manhole shall be refilled to the top of the cone, if necessary, and ANSI/ASTM measuring time of at least eight (8) hours shall begin. At the end of the test period, the manhole shall be refilled to the top of the cone, measuring the volume of water added. This amount shall be extrapolated to a 24-hour rate and the leakage determined on the basis of depth. The leakage for each manhole shall not exceed 1 gallon per vertical foot for a 24 hour period. If the test fails this requirement, but the leakage does not exceed three (3) gallons per vertical foot per day, repairs by approved methods may be made as directed by the ENGINEER to bring the leakage within the allowable rate of one (1) gallon per foot per day. Leakage due to a defective section or joint or exceeding the three (3') gallon per vertical foot per day, shall be cause of the rejection of the manhole. It shall be the CONTRACTOR'S responsibility to uncover the manhole as necessary to disassemble, reconstruct or replace it as directed by the ENGINEER. The manhole shall

then be retested and, if satisfactory, all interior joints and those exterior joints within six (6') feet of the surface shall be filled and painted.

B. The test may be conducted either before or after backfilling around the manhole. However, if the CONTRACTOR elects to backfill prior to testing, for any reason, it shall be at his own risk, and it shall be incumbent upon the CONTRACTOR to determine the reason for any failure of the test. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorption, etc., that is, it will be assumed that all loss of water during the test is a result of leaks through the joints or through the concrete.

3.7 Connection to Existing Manholes: Connections to existing masonry or concrete manholes shall be made by breaking an opening through the wall, and into the invert if needed, at the proper location and elevation. The opening shall be large enough to accept the new pipe with minimum two (2") inch annular clearance. The barrel of the new pipe shall be fitted with the specified Manhole Water stop, clamped in place with a stainless steel band as recommended by the water stop manufacturer. The pipe shall be completely blocked and supported at the proper line and grade and the annular space shall be filled with the specified non-shrink cement mortar grout. The invert, flow channels and shelves shall be formed of this same material and shall be shaped as for new manholes. Where the difference in elevation between the new incoming sewer and the existing outgoing sewer is greater than two (2') feet, the connection shall include construction of a new drop inlet connection on the existing manhole. Any visible leakage shall be sealed and repaired by the Contractor prior to acceptance.

3.8 Construct Sewer Manhole Over Existing Gravity Sewer Main: The new manhole shall be constructed over the existing gravity sewer main. The upstream manhole shall be temporarily plugged and provisions shall be made to provide temporary bypass of sewer from the upstream manhole. The portion of the gravity sewer main which falls inside of the proposed manhole shall be cut flush with the walls of the proposed manhole and removed. The barrel of the gravity sewer main shall be fitted with the specified manhole water stop and clamped in place with a stainless steel band as recommended by the water stop manufacturer. The pipe shall be completely blocked and supported at the proper line and grade and the annular space shall be filled with the specified non-shrink cement mortar grout. The annular spaces and downstream inlet shall be filled with the specified non-shrink cement mortar grout. Plug shall be removed from upstream manhole to allow raw sewage to flow.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Sanitary Sewer Manholes:

A. Measurement: New sanitary sewer manhole, of the various depths, including excavation and native backfill, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Each installed, tested and accepted.

B. Payment: New sanitary sewer manhole, measured as provided above, will be paid at the Contract unit price per Each for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all

approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere)(Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere) (Pavement Repair or Replacement Paid Elsewhere) (Select Backfill Paid Elsewhere)(Traffic Control Paid Elsewhere) (Bedding and/or Foundation Paid Elsewhere).

C. Pay Items:

4' Manhole (0-6' Deep)(05120)(01) per Each

4' Manhole (6-8' Deep)(05120)(02) per Each

4' Manhole (8-10' Deep)(05120)(03) per Each

4' Manhole (10-12' Deep)(05120)(04) per Each

4' Manhole (12-14' Deep)(05120)(05) per Each

4' Manhole (14-16' Deep)(051200)(06) per Each

5 ft. Diameter Sewer Manhole (16' - 20' Depth)(05120)(07) per Each

6 ft. Diameter Sewer Manhole (16' - 20' Depth)(05120)(08) per Each

4.2 Manhole Drop Inlet:

A. Measurement: Manhole drop inlet, of the various depths, including excavation and native backfill, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per the Each installed and accepted.

B. Payment: Manhole drop inlet, measured as provided above, will be paid at the Contract unit price per Each for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere)(Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere) (Pavement Repair or Replacement Paid Elsewhere) (Select Backfill Paid Elsewhere)(Traffic Control Paid Elsewhere) (Bedding and/or Foundation Paid Elsewhere).

C. Pay Items:

Manhole Drop Inlet (0-6' Deep)(05120)(09) per Each

Manhole Drop Inlet (6-8' Deep)(05120)(10) per Each

Manhole Drop Inlet (8-10' Deep)(05120)(11) per Each

Manhole Drop Inlet (10-12' Deep)(05120)(12) per Each

Manhole Drop Inlet (12-14' Deep)(05120)(13) per Each

Manhole Drop Inlet (14-16' Deep)(05120)(14) per Each

4.3 Sewer Manhole Testing:

A. Measurement: Sewer manhole testing, including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per the Each manhole tested.

B. Payment: Sewer manhole testing, measured as provided above, will be paid at the Contract unit price per Each for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices.

C. Pay Items:

Sewer Manhole Testing (05120)(15) per Each

4.4 Removal of Existing Sewer Manholes:

A. Measurement: Sewer manhole removal, of the various depths, including excavation and native backfill, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per the Each acceptably demolished and removed.

B. Payment: Sewer manhole removal, measured as provided above, will be paid at the Contract unit price per Each for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere)(Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere)(Pavement Repair or Replacement Paid Elsewhere)(Select Backfill Paid Elsewhere)(Traffic Control Paid Elsewhere)

C. Pay Items:

Remove Existing Sewer Manhole (0-6 Feet Deep) (05120)(16) per Each

Remove Existing Sewer Manhole (6-8 Feet Deep) (05120)(17) per Each

Remove Existing Sewer Manhole (8-10 Feet Deep) (05120)(18) per Each

Remove Existing Sewer Manhole (10-12 Feet Deep) (051200)(19) per Each

Remove Existing Sewer Manhole (12-14 Feet Deep) (05120)(20) per Each

Remove Existing Sewer Manhole (14-16 Feet Deep) (05120)(21) per Each

- END OF SECTION -

SECTION 05140

INFILTRATION AND INFLOW (I & I) - GENERAL

PART 1 - GENERAL

1.1 Scope: The purpose of this Section is to describe the intent of Infiltration and Inflow (I&I) remediation work. Typical I&I sources include broken, offset or separated pipe joints, broken pipe barrels, separated pipe connections to manholes, broken manholes, deficient services and cleanouts, etc. The I&I remediation work will be an on-site field based operation coordinated between the CONTRACTOR and the ENGINEER and/or his Representative within the Task Order project work area.

1.2 Intent: The intent of the I&I remediation work included in this project is to eliminate and/or reduce, as much as is practical, significant sources of I & I which may occur along the gravity sewer collection system. It is the intent of this project to utilize the repair methods outlined in these specifications as much as is practical. It is acknowledged that there are numerous methods by which to reduce I&I and that all possible methods of reducing I&I are not addressed by these Specifications. It is also acknowledged that the most practical means of addressing a particular I&I problem may not be determined until the problem is unearthed. When field evidence proves that the repair methods described in the Specifications is impractical, more appropriate methods shall be determined in the field with close coordination between the CONTRACTOR and the ENGINEER and/or his Representatives. In any case, it is the intent of these Specifications that the CONTRACTOR be justly compensated for any changes required by field conditions.

A. The listing of a repair does not constitute direction or approval to perform such a repair. It is understood and accepted by the CONTRACTOR that the exact nature, location, type, severity and extent of suspected defect(s) in sewer pipe, manholes and appurtenances will not be fully defined until the facility has been excavated and uncovered. The defects, if any, must be located, examined and evaluated before decisions are made regarding required repairs.

B. The ENGINEER will verify or amend the repair methods called for at the particular locations. The CONTRACTOR shall proceed with a repair with the approval of the ENGINEER.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

PART 4 - MEASUREMENT AND PAYMENT (NOT USED)

- END OF SECTION -

SECTION 05150

SMOKE TESTING

PART 1 - GENERAL

1.1 Scope: This Section covers requirements for smoke testing. Smoke testing shall be conducted as directed by the Engineer, to assist in locating deficiencies in the sewage collection system. Smoke testing shall also be performed to follow-up and verify completeness and water tightness of all point repairs, as required or as directed by the ENGINEER.

1.2 Submittals: Submit project data in accordance with provisions of Section 03340 - Shop Drawings, Samples and Project Data.

1.3 Referenced Standard: Operation and Maintenance of Wastewater Collection System - U.S. Environmental Protection Agency - Office of Water Programs, Fourth Edition or later, Chapter 5 - Inspection and Testing Collection System.

PART 2 - PRODUCTS

2.1 Smoke Bombs: Smoke bombs shall be of the three (3) to five (5) minute duration type. Use only mailable smoke bombs specified to be safe and to have no toxic or residual effects. Military type location, signal and color bombs shall not be used.

PART 3 - EXECUTION

3.1 Public Notice: The CONTRACTOR shall provide a full page "letter size" notice to each residence in the target area 24 hours prior to commencing smoke test work. The notice shall be similar in wording to the following:

PUBLIC NOTICE

TO ALL OCCUPANTS AND RESIDENTS OF THE CITY OF ALEXANDRIA.

THE CITY WILL BE CONDUCTING LEAK TESTS ON THE SANITARY SEWER SYSTEM BY BLOWING SMOKE INTO THE MAINS AND SERVICES. THE SMOKE WILL REVEAL SOURCES OF SEWER ODORS, AS WELL AS PLACES WHERE STORM WATER IS ENTERING THE SANITARY SEWER SYSTEM.

A SPECIAL NON-TOXIC SMOKE WILL BE USED IN THESE TESTS. THE SMOKE IS MANUFACTURED FOR TESTING PURPOSES, AND LEAVES NO RESIDUALS OR STAINS AND HAS NO EFFECTS ON PLANT AND ANIMAL LIFE. THE SMOKE HAS A DISTINCTIVE, BUT NOT UNPLEASANT ODOR. VISIBILITY AND ODOR LAST ONLY A FEW MINUTES; WHERE THERE IS ADEQUATE VENTILATION.

BECAUSE THE PLUMBING APPLIANCES IN YOUR HOUSE OR BUILDING ARE CONNECTED TO THE SANITARY SEWER SYSTEM, SOME OF THIS SMOKE MAY ENTER YOUR HOUSE IF ONE OR MORE OF THE FOLLOWING CONDITIONS EXIST:

--- VENTS CONNECTED TO YOUR BUILDING'S SEWER PIPES ARE INADEQUATE, DEFECTIVE OR IMPROPERLY INSTALLED.

--- TRAPS UNDER SINKS, TUBS, BASINS, SHOWERS AND OTHER DRAINS ARE DRY, DEFECTIVE, IMPROPERLY INSTALLED OR MISSING.

--- PIPES, CONNECTIONS AND SEALS OF THE WASTEWATER DRAIN SYSTEM IN AND UNDER YOUR BUILDING ARE DAMAGED, DEFECTIVE, HAVE PLUGS MISSING OR ARE IMPROPERLY INSTALLED.

RESIDENTS ARE ADVISED THAT IF TRACES OF THIS SMOKE OR ITS ODOR ENTER YOUR HOUSE OR BUILDING, IT IS AN INDICATION THAT GASES AND ODORS FROM THE SEWER SYSTEM MAY ALSO ENTER. SEWER GASES CAN BE BOTH UNPLEASANT AND DANGEROUS. LOCATION, IDENTIFICATION AND CORRECTION OF THE SOURCE OF SMOKE THAT ENTERS YOUR HOUSE IS URGENTLY ADVISED.

IF YOU HAVE ANY QUESTIONS OR DESIRE MORE INFORMATION, PLEASE TELEPHONE THE CITY OF ALEXANDRIA "UTLITIES DIVISION". (318-441-6240)

3.2 Public Emergency Personnel Consultation: The CONTRACTOR shall be responsible for notifying the Town's emergency response personnel within the "Smoke Test Area" prior to beginning smoke test. The following personnel shall be notified prior to beginning of smoke test.

A. Mayor and Executive staff - (318) 449-5000

B. Fire Department - Fire Chief and staff (318) 441-6601

C. Police Department - Police Chief and staff (318) 441-6400

D. Director of Utilities – (318) 449-5008

E. Wastewater Department – (318) 441-6240

F. Water Department – (318) 473-1264

G. Gas Department – (318) 441-6026

H. Electric Department – (318) 473-1301

I. Hospitals

J. Nursing Homes

K. Schools

All of the above shall be briefed by the CONTRACTOR regarding the Smoke Test procedures prior to beginning of smoke testing.

3.3 General: The CONTRACTOR shall provide means of conducting the smoke test in general conformance with the following:

A. Equipment: The following pieces of equipment are used and are applicable to a smoke testing operation:

1. Smoke blower unit. A squirrel cage blower with a gasoline engine and belt drive. Blower capacity will be over 1,700 CFM and under 3,000 CFM. The blower will have a base with a rubber gasket underneath the base that permits it to be set over and force a blast of air into an open manhole.

2. Pipe plugs to isolate two (2) sections of pipe; between three adjacent manholes. These may be mechanical or inflatable. Where there are high wastewater flows that prevent safe plugging of a line to be smoke tested, heavy canvas or curtains with weights or sandbags on the bottom may be used to confine the smoke to the section being tested.

3. Smoke bombs of the three-minute or five-minute duration type.

B. Operation: At the start of the operation, the smoke blower is to be located over the manhole and the ends of the pipes plugged at the two (2) next adjacent manholes. Smoke testing should not be attempted on windy days. Even a very light breeze can disperse a wisp of smoke before it is visible at a vent or the source of a leak.

1. The blower is to be started and allowed to force air into the pipe system for 5 to 10 minutes or longer (depending on volume of sewer being tested) before any smoke bomb is lit. (The purpose of forcing air into the pipe system is to get an air flow established. Since air has weight and inertia, it sometimes takes longer than 5 or 10 minutes to achieve a flow of air through a pipe system. Once a flow of air is properly established, the air will carry the telltale smoke along with it more effectively than having the blower try to push a wad of smoke into a pipe system.)

2. Once the air flow is established, one or more smoke bombs are to be lit and lowered into the manhole at the blower on metal chains, or short lengths of wire. Be sure to inspect the areas and monitor the atmosphere to confirm safe conditions before inserting any ignition source into a manhole. (Smoke bombs have a cardboard cylinder with the smoke-making chemicals inside and a single paper cover on the outside. The cardboard cylinder has perforations where the smoke escapes at frequent locations and these can be located with fingertip pressure. The perforated holes provide suitable places for a wire hook to be inserted in the smoke bomb.)

3. As soon as the smoke bomb has been lit and put into the manhole, the observers and recorders are to move out in the test area according to prearranged plans. One observer is to take one side of the street and move away from the manhole being smoked, observing the buildings on that side of the street. Another observer is to move in the same direction on the other side of the street. The other observers move in the opposite direction after inspecting the immediate area of the manhole.

a. Where proper building plumbing exists, smoke will come from the roof vents of the building drain system.

b. The observers must look at all the other parts of the building (inside and outside) and its grounds (front, back and side yards) for other indications of smoke from illegal connections.

c. Before moving on to the next house or building, the observer takes a careful look at the foundation of the building, particularly where the house service pipe would usually pass under the foundation footing.

4. The observers will cover one side of the distance between the manhole smoked and the next adjacent manhole that has been plugged.

5. In the event the smoke supply of the first bomb runs out before the area is

fully observed, a second or additional bombs shall be needed. One five-minute bomb is usually all that is needed (100,000 cubic feet of smoke) for a two-city-block run, or approximately 600 feet of pipe run. Where there are time-consuming conditions in the inspection process, as many as five (5) to six (6) smoke bombs may be necessary. In any case, the CONTRACTOR is required to utilize as many smoke bombs as necessary to properly document the smoke testing.

3.4 Recording and Photographic Documentation: All data shall be recorded on the attached Smoke Test Inventory Form. The CONTRACTOR shall keep ample copies of the blank form to catalog all visible defects for gravity main and service point repairs, gravity main and service replacement and manhole repairs. The form(s) shall be submitted to ENGINEER each time that smoke tests are conducted. In addition, each source of smoke shall be documented by photographing the leak area. The photograph shall be attached to the Smoke Test Inventory Form. Each and every smoke source visible and/or detected shall be marked or encircled with a water based washable nonpermanent bright color spray paint prior to photography.

3.5 Test Segment Limits: No more than two (2) pipe reaches, (three (3) consecutive manholes) will be allowed to be tested at any one time.

3.6 Follow up Smoke Test: Follow up smoke tests will be conducted to evaluate the effectiveness of I & I work and shall be paid for as part of these items.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Smoke Testing:

A. Measurement: Smoke testing will be measured by the linear foot of main line tested, measured from center to center of manhole, including all work, labor, tools, equipment, materials and incidentals as required to complete the item to the satisfaction of the ENGINEER for the duration of the project, including completion of the Smoke Test Inventory Form for each and every smoke leak detected including all manholes, mains and services.

B. Payment: Smoke Testing measured as provided above will be paid at the Contract unit price per linear foot including all subsequent Smoke Testing as required and/or directed by the ENGINEER for the duration of the project.

C. Pay Item: Smoke Testing (05150)(01) per linear foot.

(See Attached Smoke Test Inventory Form)

- END OF SECTION -

SMOKE TEST INVENTORY FORM

City of Alexandria, LA
Annual Requirements Contract 2026

CONTRACTOR: _____ DATE OF INSPECTION: _____

EMPLOYEE(s) NAME(s): _____

LOCATION AND DESCRIPTION OF SMOKE

NEAREST ADJACENT ADDRESS OF SMOKE LOCATED WITHIN PUBLIC PROPERTY:

ADDRESS OF SMOKE LOCATED ON PRIVATE PROPERTY:

MANHOLES & PUBLIC MAINS & SERVICES

Physical Description: (check all applicable)

- ☐ MANHOLE
  manhole number _____
- ☐ BETWEEN MANHOLES
  between mh. no's. _____
- ☐ PAVED AREA ☐ conc. ☐ asph.
- ☐ NON PAVED AREA ☐ gravel ☐ other
- ☐ RIGHT OF WAY
- ☐ SERVITUDE OR EASEMENT
- ☐ OTHER _____

ACCESSIBILITY
- ☐ very easy
- ☐ moderate
- ☐ difficult
- ☐ non accessible

SUGGESTED REPAIR TYPE
(check all applicable)
- ☐ TYPE I
- ☐ MANHOLE LOCATION AND ADJUSTMENT
- ☐ MANHOLE REHABILITATION

PRIVATE PROPERTY SERVICES

Physical Description: (check all applicable)

- ☐ YARD
- ☐ CONC. DRIVE
- ☐ ASPH. DRIVE
- ☐ SERVICE LINE
- ☐ SERVICE RISER
- ☐ CLEANOUT
- ☐ VENT STACK
- ☐ BENEATH HOUSE
- ☐ FRONT OF BUILDING
- ☐ REAR OF BUILDING
- ☐ LEFT SIDE OF BLDG.
- ☐ RIGHT SIDE OF BLDG.

ACCESSIBILITY
- ☐ very easy
- ☐ moderate
- ☐ difficult
- ☐ non accessible

SUGGESTED REPAIR TYPE
(check all applicable)
- ☐ TYPE II
- ☐ TYPE III

PROPERTY OWNER COMMENTS OR NOTES: _____

DEFECT IDENTIFIED BY:
(check all applicable)
- ☐ SMOKE TEST
- ☐ VISUAL INSPECTION
- ☐ PROPERTY OWNER
- ☐ OTHER _____

REPAIR MADE:
(check all applicable)
- ☐ TYPE I ☐ TYPE II ☐ TYPE III
- ☐ MANHOLE LOCATION AND ADJUSTMENT ☐ MANHOLE REHABILITATION

DESCRIPTION: _____

Place color photograph here

END OF SECTION – 05150

SECTION 05160

TELEVISION (CCTV) INSPECTION

PART 1 - GENERAL

1.1 Scope: This section covers requirements for television (TV) inspection of interior of gravity mains and appurtenances and storm drains and appurtenances both with and/or without dye water flooding. The intent is to provide video inspection and evidence of the interior of existing sanitary sewer mains for defects and dye water intrusion of storm drain system into sanitary sewer system and vise-versa.

1.2 Submittals: Submit project data in accordance with provisions of Section 03340 - Shop Drawings, Samples and Project Data.

PART 2 – PRODUCTS

2.1 Video Equipment (CCTV):

A. The camera shall be operative in 100% humidity conditions. The camera, television monitor, and other components of the video system shall be capable of producing the picture quality required to properly evaluate the condition of the pipe being inspected. The camera shall have an imager with a min. 0.7 lux sensitivity and utilize high intensity discharge lamps for illumination. Maintenance of video equipment is a must. Camera distortions, inadequate lighting, dirty lens or blurred haze picture will be cause for rejection.

B. The system shall have recording capability onto a digital video disk (DVD) along with written information identifying each pipe segment inspected and a metering device measuring the distance traveled from the launching manhole measured to the nearest whole foot. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe. Digital videos of poor unacceptable quality will be rejected. Re-recording will be at no additional cost to the OWNER.

C. DVD video format shall be a minimum MPEG-2 compressed video and resolution video format shall be SIF (Standard Image Format) of 720 x 480 pixels for National Television System Committee (NTSC) Video Standard. Videos shall be submitted in one continuous section from manhole to manhole unless specifically approved by the ENGINEER.

2.2 "Push" Camera: The camera shall be operative in 100% humidity conditions. The camera, television monitor, and other components of the video system shall be capable of producing the picture quality required to properly evaluate the condition of the pipe being inspected. Push cameras are not required to have recording capabilities. Push camera is for instant on-site use and not required for recording.

2.3 Dye: Dye shall be non-toxic to the habitat of the color required by the ENGINEER.

PART 3 - EXECUTION

3.1 CCTV Inspection of Main Lines:

A. Each section of main to be inspected shall be videotaped utilizing a closed circuit television camera specifically designed and constructed for this purpose. Lighting for the camera shall be sufficient to allow a clear picture of the entire periphery of the pipe. The camera shall be operative in 100% humidity conditions. The camera, television monitor, and other components of the video system shall produce a color picture the quality of which shall be to the satisfaction of the ENGINEER.

B. The camera shall traverse the line section in both directions at a moderate rate, stopping when necessary to permit proper documentation of the sewer conditions. The maximum rate of television camera travel shall be less than 30 feet per minute. Manual winches, power winches, TV cable, powered rewinds or other devices which do not obstruct the view or interfere with proper documentation of sewer conditions shall be used to move the camera through the sewer line. If, during the inspection operation, the television camera will not traverse the entire length of line section, the Contractor shall relocate the equipment and perform the inspection from the opposite manhole. If, again, the camera fails to pass through the entire line section because of an obstruction, the inspection shall be considered complete and no additional inspection work will be required.

C. When manually operated winches are used to pull the television camera through the line section, a suitable means of communication shall be set up between crew members at each end of the line section being inspected.

D. Distance measurements shall be accurately made and recorded. Measurements of defect locations shall be made aboveground using an approved metering device. Cable markings or other means which would require adjustments for manhole depths, will not be allowed. Distance meter accuracy shall be checked by use of a walking meter, roll-a-tape, or other device, satisfactory to the ENGINEER.

E. Photographs of each major defect shall be provided. Not more than four (4) images will be required per line section televised. A videotape recording of each line section shall be made by the Contractor. Tapes shall provide a complete color video and audio record of the entire inspection. Images from ongoing inspections shall be displayed on site utilizing a suitable TV unit. The TV unit shall have the capability of imprinting the written information concerning the pipe under inspection. The Contractors observations during the inspection shall be recorded on a "Television Inspection Report". The report shall indicate the internal condition of the line section, any deviations in line and grade, abnormal conditions of the pipe barrel and joints, building sewer connection locations, and the located and estimated quantity of each source of infiltration and inflow.

3.2 CCTV Deliverables:

A. A DVD recording shall be made by the CONTRACTOR of all pipe and manhole sections television inspected and photographed. Each line segment and manhole shall be recorded and saved in a continuous single digital video file labeled in accordance with the form shown below. The digital video will include a complete "color" video and audio record of the entire inspection. The digital video shall have the capability of permanently displaying information concerning the segment inspected, including the date, upstream and downstream manhole (MH) numbers, GPS manhole coordinates, the size of pipe, and the footage counter.

B. All digital video files shall also be submitted on DVD-ROM with a file reference number, which have been scanned for viruses. The DVD index sheet shall be labeled with the DVD reference number, the project name, project number, date of inspection, and upstream and downstream manhole numbers listed by line segments as they appear on the DVD. The television inspection shall be recorded directly to digital format as specified herein. Recording to other media and converting to digital format are not acceptable.

C. The inspection sheets, electronic database, and DVD of all television inspections of sewer lines and manholes shall be kept by the CONTRACTOR and submitted to the ENGINEER. All inspection sheets shall be submitted on the standard inspection form. The digital videos, images and disks shall become the property of the OWNER.

3.3 Push Camera Inspection of Main Lines: Push camera inspection of main lines shall be conducted in order to ascertain the conditions of the interior of sewer main lines that were not included in the original CCTV inspection referred to in Specification Section 03140 or those areas that were inaccessible to television inspection due to pipe defects.

3.4 Follow Up TV Inspection: Follow-up TV inspections will be conducted to evaluate the effectiveness of CIPP lining and Pipe Bursting operations and shall be paid for as part of those items.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Inspection of Main Lines:

A. Measurement: TV inspection with or without dye water flooding, of the various signs of main lines, shall be measured on a linear foot basis, measured to the nearest whole foot, from center of upstream manhole to center of downstream manhole.

B. Payment: TV Inspection with dye water flooding, of main lines, measured as provided above, will be paid at the Contract Unit Price per linear foot which price and payment shall constitute full compensation for television inspection, one equipment set-up per line segment, dewatering, camera retrieval, defect coding, report and DVD production in accordance with the Specifications.

C. Pay Items:

TV Inspection with Dye Water Flooding (6"-10")(05160)(01) per Linear Foot.

TV Inspection with Dye Water Flooding (12"-16")(05160)(02) per Linear Foot.

TV Inspection of 6" – 18" Sewers (05160)(03) per Linear Foot.

TV Inspection of 21" – 36" Sewers (05160)(04) per Linear Foot.

TV Inspection of 48" – 54" Sewers (05160)(05) per Linear Foot.

4.2 Additional/Reverse Setup (TV Inspection):

A. Measurement: Additional/Reverse Setup (TV Inspection) required due to pipe obstructions and as authorized by the ENGINEER shall be measured per each for every additional setup after the initial setup per line segment.

B. Payment: Additional/Reverse Setup (TV Inspection), measured as provided above, will be paid at the Contract Unit Price per each, which price and payment shall constitute full compensation for the additional setup costs for full length camera inspection after encountering blockage.

C. Pay Items: Additional/Reverse Setup (TV Inspection) (05160)(06) per Each as authorized by the ENGINEER.

4.3 Push Camera TV Inspection:

A. Measurement: Push Camera TV inspection shall be measured on a linear foot basis, measured to the nearest whole foot, from the point of insertion into the main line.

B. Payment: Push Camera TV inspection, measured as provided above, will be paid at the Contract Unit Price per linear foot which price and payment shall constitute full compensation for television inspection, one equipment set-up per line segment, dewatering, camera retrieval in accordance with the Specifications.

C. Pay Items: Push Camera TV Inspection (05160)(07) per Linear Foot.

(See Attached T.V. Inspection Report Form)

- END OF SECTION -

TV. INSPECTION REPORT FORM

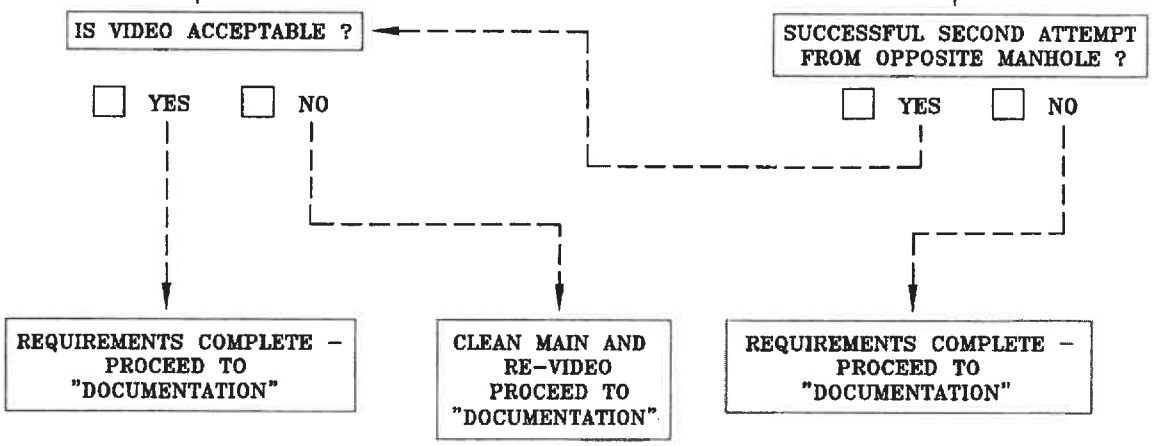
City of Alexandria, LA
Annual Requirements Contract 2026

CONTRACTOR: _____ DATE OF INSPECTION: _____

EMPLOYEE(s) NAME(s): _____

UPSTREAM AND DOWNSTREAM MANHOLE NUMBERS: _____ & _____ DISTANCE BETWEEN MANHOLES: _____ (feet)

MAIN ACCESSIBLE AND PROPERLY VIDEOED ON THE FIRST ATTEMPT ? ☐ YES ☐ NO



"DOCUMENTATION"

_____
STREET NAME

_____ L.F. OF _____" _____SEWER

_____(feet)
SMH DEPTH

_____(feet)
SMH DEPTH



_____
UPSTREAM SMH
NO. AND STA.

_____
DOWNSTREAM SMH
NO. AND STA.

GENERAL DISCRIPTION / CONDITION OF MAIN: _____

_____

_____

_____

SUGGESTED REMIDIATION(s): _____

_____

– END OF SECTION –
05160

SECTION 05170

SEWER LINE CLEANING

PART 1 - GENERAL

1.1 Scope: The intent of sewer line cleaning is to sufficiently clean the interior of the pipes to allow for adequate television (TV) inspection. Sewer line cleaning shall remove all sludge, dirt, sand, rocks, grease, and other solids or semisolid material from the pipe so that defects are not obscured and to allow the water level to drop so that defects are visible. The pipe interior shall be clean enough to allow adequate viewing of the entire pipe during inspection. Preparatory cleaning shall be performed prior to TV inspection, sewer lining, etc.

1.2 Submittals: Submit product data in accordance with provisions of Section 03340 - Shop Drawings, Samples and Project Data.

1.3 Definitions: For the purposes of this Contract, the following terms will be defined as follows:

A. Cleaning by Jetting: Sewer Line Cleaning by jetting shall be performed by high velocity water jetting or movable dam used to loosen and transmit material for extraction.

B. Cleaning by Mechanical Means: Mechanical Sewer Line Cleaning shall be performed by mechanical equipment when water jetting is unsuccessful. In NO case shall mechanical cleaning be used on PVC or clay pipe. Mechanical cleaning of sanitary sewers shall be conducted on lines at the direction of the ENGINEER. Mechanical cleaning shall remove all foreign materials from the lines. The CONTRACTOR shall not be responsible for removing mortar or other similar material that is permanently attached to the pipe walls.

PART 2 - PRODUCTS

2.1 Water: Water for sewer cleaning shall be purchased by the CONTRACTOR and obtained at locations in accordance with the utility owner, as directed. If the water is obtained from a potable supply, appropriate "high hazard" backflow prevention devices as identified in by the LA Department of Health and Hospitals "Sanitary Code" referred to as IPC 2012- Table 608.18.1 (Containment Practices) shall be provided to protect the potable system from cross connections and contamination. CONTRACTOR shall be solely responsible for preventing cross contamination of any public or private water systems used for this purpose.

PART 3 - EXECUTION

3.1 Acceptable Methods: Sewer line cleaning shall be performed by electronically or manually operated, directly or remotely controlled, mechanically or hydraulically propelled cleaning equipment as described in this specification.

3.2 Sewer Cleaning:

A. Sanitary sewer line sections shall be cleaned using mechanically powered, hydraulically propelled, or high velocity sewer cleaning equipment. Equipment selection shall be based on the condition of the lines at the time the work begins. The selected equipment and methods shall be satisfactory to the ENGINEER. The equipment selected for cleaning shall be capable of removing dirt, grease, rocks, sand, sticks, branches, leaves and other deleterious materials and obstructions from the sewer lines and manholes. If cleaning of an entire section cannot be successfully performed from one manhole, the equipment shall be re-setup at the manhole on the opposite end of the pipe segment being cleaned and cleaning shall be re-attempted.

B. During all sewer-cleaning operations, satisfactory precautions shall be taken to protect the sewer lines from damage that might be inflicted by the improper use of cleaning equipment. Whenever hydraulically propelled cleaning tools or tools which retard the flow in the sewer line are used, precautions shall be taken to ensure that the water pressure created does not cause any damage or flooding to adjacent property. The flow of sewage in the sewer lines shall be utilized to provide necessary pressures for hydraulic cleaning devices whenever possible.

C. The CONTRACTOR shall obtain permission from the OWNER prior to obtaining water from fire hydrants. All connections to the public water system shall be equipped with an approved backflow prevention device in accordance with the Louisiana State Plumbing Code (Refer to paragraph 2.1 of this Section). Potable water shall be conserved and not used unnecessarily. No fire hydrant shall be obstructed or used when there is a fire in the area. CONTRACTOR shall remove the water meter(s)/piping, etc. from all fire hydrants at the end of each working day.

D. The retrieval of equipment lodged in pipes or manholes is the CONTRACTOR'S responsibility and will be performed at the CONTRACTOR'S expense.

E. If during cleaning operations the cleaning equipment will not pass through the entire section from manhole to manhole because of an obstruction such as a dropped joint, crushed pipe, etc., the CONTRACTOR shall perform an additional/reverse setup of his equipment so that the cleaning can be performed from the opposite end. If again cleaning operations fail, the ENGINEER shall be immediately notified. The obstructed section of pipe may then be considered for a "point repair".

3.3 Material Removal: All sanitary sewer lines to be cleaned shall be plugged at the discharge end prior to cleaning. All sludge, dirt, sand, rocks, grease, and other solid or semi-solid material resulting from the cleaning operation shall be removed at the downstream manhole of the section being cleaned. Passing material from one sewer line section to another sewer line section, or from manhole section to manhole section shall not be permitted except when using high velocity jet equipment. The maximum limit before material is removed will be approximately 600'.

3.4 Disposal of Material: All solids or semi-solids resulting from the cleaning operations shall be removed from the site and disposed of at a legally permitted site for that purpose. At a

minimum all materials shall be removed from the site at the end of each workday. Under no circumstances will the CONTRACTOR be allowed to accumulate debris, etc., on the site of work beyond the stated time, except in totally enclosed containers and as approved by the ENGINEER. CONTRACTOR shall be responsible for all fees and tipping charges for disposal. The CONTRACTOR must follow all current applicable local, state and federal rules and laws regarding the appropriate disposal of waste materials from cleaning operations. Under no circumstances shall sewage or solids removed in the cleaning process be dumped into streets, ditches, catch basins, storm drains, sanitary sewer manholes, cleanouts, or dumps.

3.5 Inspection: Inspection of all cleaning operations will be made on a daily basis by the ENGINEER.

3.6 Acceptance: Television inspection in accordance with Section 05160 - Television (CCTV) Inspection. Inspection shall be performed to ensure the ENGINEER that proper cleaning of the line has been performed. If inspection shows the cleaning to be unsatisfactory to the ENGINEER, the CONTRACTOR will be required to re-clean and re-inspect the sewer line section until the cleaning is acceptable at no additional cost.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Gravity Sewer Pipe Cleaning:

A. Measurement: Gravity sewer pipe cleaning, of the various sizes, including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured by the Linear Foot cleaned and accepted.

B. Payment: Gravity sewer pipe cleaning, measured as provided above, will be paid at the Contract unit price per Linear Foot for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices.

C. Pay Items:

Clean 6", 8" and 10" Sewer Less than 1/3 Pipe Debris (05170)(01) per Linear Foot

Clean 6", 8" and 10" Sewer Less than 1/3 Pipe Debris Within Off-Road Easement (05170)(02) per Linear Foot

Clean 6", 8" and 10" Sewer Greater than 1/3 Pipe Debris (05170)(03) per Linear Foot

Clean 6", 8" and 10" Sewer Greater than 1/3 Pipe Debris Within Off-Road Easement (05170)(04) per Linear Foot

Clean 12" and 15" Sewer Less than 1/3 Pipe Debris (05170)(05) per Linear Foot

Clean 12" and 15" Sewer Less than 1/3 Pipe Debris Within Off-Road Easement (05170)(06) per Linear Foot

Clean 12" and 15" Sewer Greater than 1/3 Pipe Debris (05170)(07) per Linear Foot

Clean 12" and 15" Sewer Greater than 1/3 Pipe Debris Within Off-Road Easement (05170)(08) per Linear Foot

Clean 18" and 21" Sewer Less than 1/3 Pipe Debris (05170)(09) per Linear Foot

Clean 18" and 21" Sewer Less than 1/3 Pipe Debris Within Off-Road Easement (05170)(10) per Linear Foot

Clean 18" and 21" Sewer Greater than 1/3 Pipe Debris (05170)(11) per Linear Foot

Clean 18" and 21" Sewer Greater than 1/3 Pipe Debris Within Off-Road Easement (05170)(12) per Linear Foot

Clean 24" and 27" Sewer Less than 1/3 Pipe Debris (05170)(13) per Linear Foot

Clean 24" and 27" Sewer Less than 1/3 Pipe Debris Within Off-Road Easement (05170)(14) per Linear Foot

Clean 24" and 27" Sewer Greater than 1/3 Pipe Debris (05170)(15) per Linear Foot

Clean 24" and 27" Sewer Greater than 1/3 Pipe Debris Within Off-Road Easement (05170)(16) per Linear Foot

Clean 30" and 36" Sewer Less than 1/3 Pipe Debris (05170)(17) per Linear Foot

Clean 30" and 36" Sewer Less than 1/3 Pipe Debris Within Off-Road Easement (05170)(18) per Linear Foot

Clean 30" and 36" Sewer Greater than 1/3 Pipe Debris (05170)(19) per Linear Foot

Clean 30" and 36" Sewer Greater than 1/3 Pipe Debris Within Off-Road Easement (05170)(20) per Linear Foot

Clean 48" Sewer Less than 1/3 Pipe Debris (05170)(21) per Linear Foot

Clean 48" Sewer Greater than 1/3 Pipe Debris (05170)(22) per Linear Foot

Clean 54" Sewer Less than 1/3 Pipe Debris (05170)(23) per Linear Foot

Clean 54" Sewer Greater than 1/3 Pipe Debris (05170)(24) per Linear Foot

- END OF SECTION -

SECTION 05172

ROOT REMOVAL

PART 1 - GENERAL

1.1 Scope: This Section covers root removal of existing sanitary sewer mains by rodding, expanding cutters, jetting, or other approved methods.

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 Methods: The Contractor shall take special precautions to assure removal of all visible roots which may prevent the sealing of a grouting packer or may affect the rehabilitation of the pipe. The use of mechanical devices such as rodding machines, expanding root cutters, and hydraulic procedures such as high pressure jet cleaners shall be used, if required. All roots removed from the joint area shall be removed from the downstream manhole of the line section containing the roots.

Materials resulting from root removal operations shall be disposed of by the Contractor daily. The Owner may furnish sites for disposal of materials removed from the sewer system. Material shall be disposed of in an environmentally approved manner.

The work shall be performed in a manner which will not damage the pipe, manholes, access points or the working area. The Contractor shall repair all damage and restore the working area at no separate pay.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Root Removal:

A. Measurement: Root removal, within sewer lines of the various sizes, including removal and disposal and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and/or as directed by the ENGINEER, will be measured by the Linear Foot per size of main.

B. Payment: Root removal, measured as provided above, will be paid at the Contract unit price per Linear Foot of pipe de-rooted.

C. Pay Items:

Root Removal – 6" Sewer Pipe (05172)(01) per Linear Foot

Root Removal – 8" Sewer Pipe (05172)(02) per Linear Foot

Root Removal – 10" Sewer Pipe (051722)(03) per Linear Foot

Root Removal – 12" Sewer Pipe (05172)(04) per Linear Foot

Root Removal – 15"-21" Sewer Pipe (05172)(05) per Linear Foot

- END OF SECTION -

SECTION 05174

CHEMICAL ROOT TREATMENT

PART 1 - GENERAL

1.1 Scope: This Section covers the requirements for application of foaming chemical root control agent for sanitary sewers in order to kill the root growth present in the lines and to inhibit re-growth without permanently damaging the vegetation producing the roots.

1.2 Pollution and Liability Insurance: The Pollution Liability Insurance described herein is addition to all other insurance required of the CONTRACTOR by the OWNER, including any insurance described in the General or Supplemental Conditions.

At the time issuance of a Task Order that includes Foaming Root Control services, The CONTRACTOR shall submit written evidence that he has obtained pollution liability coverage as noted. This coverage shall protect the CONTRACTOR, the OWNER, and the OWNER's officers, agents and employees, 3rd Party ENGINEERs and employees and agents, etc. from claims for damages for bodily or personal injury, sickness or disease, including death, and from claims for damages to property and/or the environment, which may arise directly out of the use of chemicals and/or pollution. The minimum amount of such insurance shall be $1,000,000 total loss. An "A" rated insurance company shall provide the CONTRACTOR's Pollution Liability Insurance.

1.3 Qualifications: At the request of the ENGINEER, prior to issuance of a Task Order, the CONTRACTOR or Subcontractor shall provide evidence of a minimum level of five (5) years direct experience in applying chemical sewer root control agents. The CONTRACTOR, or his Subcontractor, must have performed at least 10 other jobs similar in size and scope to the work specified herein, and have treated in excess of 500,000 linear feet of sanitary sewer with it's own personnel within the last 24 months.

The CONTRACTOR or Subcontractor shall be licensed as a pesticide application business with the Louisiana Department of Agriculture prior to issuance of a Task Order.

1.4 Guarantee:

For each sewer section (manhole-to-manhole) that is treated under a Task Order, the CONTRACTOR shall guarantee the work as follows. At the option of the OWNER, the CONTRACTOR shall, at his own expense, re-treat a sewer section, or refund 100% of the payment received to treat that section, in the event that: (1) live roots are found in the section within six months after the application; or, (2) the section plugs up and floods due to tree root obstructions within a period of two years, beginning on the date of treatment, and ending two years after the date of treatment. Re-treatments, performed at no charge in honor of the guarantee, do not extend the expiration date of the guarantee.

The guarantee applies to sewer stoppages caused by live tree roots. It does not apply to stoppages caused by grease or other foreign matter; flat, collapsed or deformed pipe; or flooding caused by a surcharged or plugged sewer section downstream from a guaranteed sewer section. This guarantee applies to main line sewers only. The CONTRACTOR is not

responsible for any damages caused by main line sewer stoppages, regardless of cause. The decision of the OWNER as to the cause of a stoppage is binding.

1.5 Submittals: Provide product data in conformance with Section 031340 – Shop Drawings, Samples and Product Data including:

A. Pollution Liability Insurance Certificate

B. Contractor's Confined Space Entry "Employee Certificates" Two (2) Minimum

C. Product Data

D. Surfactant System

PART 2 – PRODUCTS

2.1 Chemical Root Control Material:

The chemical root control agent shall be Razorooter II or equivalent product that is approved by the ENGINEER. The chemical root control agent shall be registered with the EPA and the Louisiana Department of Agriculture and shall be labeled for use in sewers to control tree roots. The chemical root control agent shall contain an active ingredient for controlling sewer roots and deterring their re-growth. There shall also be a surfactant system to deliver the active ingredient (herbicide) to the target root tissue.

A. Active Ingredient:

1. Shall be a Category "E" compound, the most favorable rating attainable on the US. EPA's chronic exposure toxicological rating scale.

2. Shall not be considered a carcinogen, teratogen, mutagen, or oncogene, based on laboratory testing.

3. Shall be non-volatile in order to minimize exposure to collections system workers, treatment plant operators and homeowners through inhalation.

4. Products containing the active ingredient(s) metam-sodium or copper sulfate are not allowed.

B. Surfactant System:

1. Shall produce a dense, small bubble, clinging foam, which sustains its shape for a minimum of one hour.

2. Shall enhance the penetration of herbicide into root masses.

3. Shall contain an Alkylpolyglucoside (formulations of vegetable oil and

carbohydrate from agricultural products).

4. Surfactants designed to foam chemically, upon contact with water, shall not be accepted.

PART 3 - EXECUTION

3.1 Compliance with Laws: The CONTRACTOR is directed to ensure compliance with all Federal, State and Local ordinances pertaining to the type of work specified herein. Particular attention shall be paid to those laws and ordinances relating to transportation of material (DOT), the application of sewer root control herbicides (US EPA), and traffic safety regulations. The CONTRACTOR's Federal DOT number and material EPA registration number must be submitted.

3.2 Manner of Application:

All work shall be performed according to label instructions and in accordance with the best recommended practice for conditions present in the line under treatment. All applications shall be done by foaming or other methods as provided on the product label.

The application of material shall be performed in such a way as to contact roots within the primary main line sewer to be treated. Effort will also be made to penetrate secondary lateral sewers in order to contact roots residing in the "wye" connections. The foam shall be generated through the use of air injection equipment, and the foam shall be pumped into the sewer under pressure as foam. Foam quality shall be sufficient to penetrate "wye" connections and effectively treat large diameter pipe. Therefore, applications of chemicals designed to generate foam "chemically" on contact with water shall not be accepted.

Hydraulic sewer cleaning machines will reduce treatment effectiveness by damaging root growths and inhibiting their uptake of chemical. Hydraulic sewer cleaning machines shall not be used prior to, or during the treatment process.

3.3 Assistance Provided by the OWNER:

A. A representative of the OWNER will accompany the CONTRACTOR's crew, and/or sewer system drawings will be provided showing the exact locations of the pipes to be treated.

B. The OWNER shall provide for the entering of private lands, public lands and right-of-ways.

C. The OWNER shall provide a source of fresh water at a location or locations to be designated by the OWNER.

3.4 Property Damages Caused by the CONTRACTOR: Should the CONTRACTOR or his employees cause any damage to public or private property the CONTRACTOR will be required to make repairs immediately.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Chemical Root Treatment:

A. Measurement: Chemical root treatment, including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and/or as directed by the ENGINEER, will be measured by the Linear Foot.

B. Payment: Chemical root treatment, measured as provided above, will be paid at the Contract unit price per Linear Foot.

C. Pay Items:

Foaming Root Control Service – 6" Pipe (05174)(01) per Linear Foot

Foaming Root Control Service – 8" Pipe (05174)(02) per Linear Foot

Foaming Root Control Service – 10" Pipe (05174)(03) per Linear Foot

Foaming Root Control Service – 12" Pipe (05174)(04) per Linear Foot

Foaming Root Control Service – 16" Pipe (05174)(05) per Linear Foot

Foaming Root Control Service – 18" Pipe (05174)(06) per Linear Foot

Foaming Root Control Service – 24" Pipe (05174)(07) per Linear Foot

- END OF SECTION -

SECTION 05180

GRAVITY SEWER MAIN POINT REPAIRS

PART 1 - GENERAL

1.1 Scope: This Section covers "single source" main line point repairs and "main line" point repairs, as authorized by ENGINEER, and includes all excavation and native backfilling necessary to locate, evaluate and repair or replace defective areas of the sewer lines, as well as all acceptance testing required by the Engineer. ("Select Material" for backfill measured and paid elsewhere

1.2 Schedule of Repairs: The Engineer may amend the scope of work regarding gravity sewer main point repairs as construction proceeds and where defective sections of pipe are discovered by direct visual observation.

1.3 Submittals: Submit product data in accordance with provisions of Section 03340 - Shop Drawings, Samples and Project Data.

1.4 Definitions: For the purposes of this Contract, the following terms will be defined as follows:

A. Single Source Point Repair: Those repairs located on 8" diameter or larger gravity mains, which require excavation from the surface to accurately locate sources of infiltration and inflow and to eliminate them by making the necessary repair(s). This work requires sealing or closing an opening in pipe or fitting(s) which shall remain in place. These repairs are accomplished with wrap-around repair sleeves or couplings or the removal and replacement of a section of pipe less than three (3') in length.

B. Main Line Point Repair: Those repairs located on 8" diameter or larger gravity mains, which require excavation from the surface to accurately locate sources of infiltration and inflow and to eliminate them by making the necessary repair(s). This work requires removal and replacement of a section of pipe greater than three (3') in length but less than sixteen feet (16'), which is the nominal length of one (1) new joint of PVC ASTM D 3034 pipe. Extensions to main line point repairs include extending the excavation in one or both directions by 6' and extending the main line point repair in one or both directions by 4'. The maximum pay length for excavation for main line point repair is 28' (16' + 6' + 6'). The maximum pipe pay length for main line point repair is 26' (2' less than maximum trench length).

1.5 Measurement, Payment and Compensation: For the purposes of measurement, payment and compensation, it will be assumed that all repairs shall begin as either a "single source point repair" or a "main line point repair". Excavation and inspection will determine if the repair transforms to a "sewer main pipe replacement". When the replaced length of pipe exceeds 26', the repair will then be deemed a "sewer main pipe replacement". Once the length of replacement pipe exceeds 26' the initial 26' of deficient pipe shall be paid under the "main line point repair " pay item and associated excavation and embankment pay items. The balance of pipe in excess of 26' shall be paid under the "sewer main pipe replacement" pay item.

PART 2 - PRODUCTS

2.1 Pipe and Fittings: Refer to Section 05110 - Gravity Sanitary Sewer Systems and Related Appurtenances.

2.2 Bedding and Haunching: Refer to Section 05110 - Gravity Sanitary Sewer Systems and Relate Appurtenances.

2.3 Initial and Final Backfill: Refer to Section 05110 - Gravity Sanitary Sewer Systems and Relate Appurtenances.

2.4 Couplings: Refer to Section 05110 - Gravity Sanitary Sewers and Appurtenances.

PART 3 - EXECUTION

3.1 Locating and Identifying the Defect:

A. Locations where point repairs are to be made are to be determined by the CONTRACTOR and the ENGINEER and/or his Representative based on previously performed television inspection.

B. The Contractor shall verify the location of proposed excavation with Engineer or ENGINEER's Representative.

C. The Contractor shall excavate and expose a sixteen (16') foot section of pipe centered upon the suspected defect location.

D. The Contractor shall locate the leak to be repaired.

E. After the leak or failure is located and exposed within the sixteen (16') foot section of pipe, the ENGINEER shall examine the defect and verify the method and extent of repairs.

3.2 Single Source Main Line Point Repair:

A. The Contractor shall seal or close the opening in pipe(s) or fitting(s) to remain in place with wrap-around repair sleeves or couplings per standard industry practice and approved by the Engineer.

B. If the failure is such that a portion of failed pipe must be removed and replaced, but said portion of pipe does not exceed three (3') in length, the Contractor shall remove section(s) of defective pipe and/or fitting by cutting on each side along lines perpendicular to the longitudinal axis of the pipe so as to leave "spigot ends" to be connected to replacement pipe. The Contractor shall fabricate a replacement section including replacements for any wyes, tees or other existing fittings encountered. Any branch fittings shall be temporarily plugged. The Contractor shall install the replacement section and make connections to adjacent pipe ends using approved couplings.

3.3 Main Line Point Repair: The Contractor shall remove section(s) of defective pipe and/or fitting by cutting on each side along lines perpendicular to the longitudinal axis of the pipe so as to leave "spigot ends" to be connected to replacement pipe. The Contractor shall fabricate a replacement section including replacements for any wyes, tees or other existing fittings encountered. Any branch fittings shall be temporarily plugged. The Contractor shall install the replacement section and make connections to adjacent pipe ends using approved couplings.

3.4 Extension of Point Repair of Sewer Main: The Engineer may direct the Contractor to extend the excavation in six (6') foot increments in a specified direction if the following conditions are found:

- The defect is not found in the initial sixteen (16') foot section of sewer main.
- The pipe defect continues past the limits of the initial sixteen (16') foot section of sewer main.

The Contractor shall not extend excavation to uncover additional pipe without the Engineer's approval. Each additional six (6') foot increment shall require approval by the Engineer.

3.5 Surface Removal and Replacement: Refer to Section 07240 – Street Pavement, Replacement and Patching and related sub-sections.

3.6 Bypass Pumping: The section or reach of pipe to be repaired shall be isolated by plugging and/or by-pass pumping as outlined in Section 05230 - Gravity Sewer By-Pass Pumping.

3.7 Excavation, Backfill and Compaction: Installation and compaction of trench bedding and placement and compaction of backfill ("select material" measured and paid elsewhere) shall be in accordance with Section 07150 - Excavation, Backfill and Compaction of Utility Trenches. Related work shall include, but not be limited to, de-watering trench as necessary to provide a safe and suitable working condition, and sheeting, shoring or bracing trench as deemed necessary to protect adjacent property and/or utilities, to prevent slides, cave-ins, settlement, or movement of banks and to maintain excavation clear of obstructions which would hinder or delay progress of work.

3.8 Installation: Installation shall be in accordance with Section 05110 - Gravity Sanitary Sewer Systems and Relate Appurtenances.

3.9 Completion: The Contractor shall reconnect sewer service lines and rebuild service risers where necessary. The Contractor shall keep careful record of the work done at each location, including photographs of completed repairs before backfilling, and shall submit the information to the Engineer.

3.10 Acceptance Testing: Prior to backfilling the excavation, the adequacy of repairs and replacements of sewer mains shall be demonstrated by the Contractor by employing smoke testing. Smoke Testing shall be in accordance with Specification Section 05150 - Smoke Testing. The repaired area shall be observed for the emergence of smoke for a period of ten (10) minutes. If none can be seen, the repair will be deemed to have passed. If the repaired area leaks smoke, the Contractor shall re-repair and retest at no expense to the Owner. The cost of re-testing with smoke shall be included in the point repair pay item.

3.11 Pipe to Manhole Connections: This work is covered in Section 05250 – Miscellaneous Sewer Manholes Repairs.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Gravity Sewer Point Repairs:

A. Measurement: Gravity sewer point repairs, of the various depths and sizes, including excavation and native backfill, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Each repair made and accepted.

B. Payment: Gravity sewer point repairs, measured as provided above, will be paid at the Contract unit price per Each for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices.

C. Pay Items:

16 L.F. 8"-12" Gravity Sewer Main Point Repair (Depth 0'-6') (Select Material paid Elsewhere) (05180)(01) per Each.

16 L.F. 8"-12" Gravity Sewer Main Point Repair (Depth 6'-8') (Select Material paid Elsewhere) (05180)(02) per Each.

16 L.F. 8"-12" Gravity Sewer Main Point Repair (Depth 8'-10') (Select Material paid Elsewhere) (051800)(03) per Each.

16 L.F. 8"-12" Gravity Sewer Main Point Repair (Depth 10'-12') (Select Material paid Elsewhere) (051800)(04) per Each.

16 L.F. 8"-12" Gravity Sewer Main Point Repair (Depth 12'-14') (Select Material paid Elsewhere) (051800)(05) per Each.

16 L.F. 8"-12" Gravity Sewer Main Point Repair (Depth 14'-16') (Select Material paid Elsewhere) (05180)(06) per Each.

16 L.F. 15"-24" Gravity Sewer Main Point Repair (Depth 0'-6') (Select Material paid Elsewhere) (05180)(07) per Each.

16 L.F. 15"-24" Gravity Sewer Main Point Repair (Depth 6'-8') (Select Material paid Elsewhere) (05180)(08) per Each.

16 L.F. 15"-24" Gravity Sewer Main Point Repair (Depth 8'-10') (Select Material paid Elsewhere) (05180)(09) per Each.

16 L.F. 15"-24" Gravity Sewer Main Point Repair (Depth 10'-12') (Select Material paid Elsewhere) (05180)(10) per Each.

16 L.F. 15"-24" Gravity Sewer Main Point Repair (Depth 12'-14') (Select Material paid Elsewhere) (05180)(11) per Each.

16 L.F. 15"-24" Gravity Sewer Main Point Repair (Depth 14'-16') (Select Material paid Elsewhere) (05180)(12) per Each.

16 L.F. 27"-36" Gravity Sewer Main Point Repair (Depth 0'-6') (Select Material paid Elsewhere) (051800)(13) per Each.

16 L.F. 27"-36" Gravity Sewer Main Point Repair (Depth 6'-8') (Select Material paid Elsewhere) (05180)(14) per Each.

16 L.F. 27"-36" Gravity Sewer Main Point Repair (Depth 8'-10') (Select Material paid Elsewhere) (051800)(15) per Each.

16 L.F. 27"-36" Gravity Sewer Main Point Repair (Depth 10'-12') (Select Material paid Elsewhere) (05180)(16) per Each.

16 L.F. 27"-36" Gravity Sewer Main Point Repair (Depth 12'-14') (Select Material paid Elsewhere) (05180)(17) per Each.

16 L.F. 27"-36" Gravity Sewer Main Point Repair (Depth 14'-16') (Select Material paid Elsewhere) (05180)(18) per Each.

8"-12" Gravity Sewer Main Point Repair Added-On (16 L.F. Max.) (Depth 0'-6') (Select Material paid Elsewhere) (05180)(19) per Each.

8"-12" Gravity Sewer Main Point Repair Added-On (16 L.F. Max.) (Depth 6'-8') (Select Material paid Elsewhere) (05180)(20) per Each.

8"-12" Gravity Sewer Main Point Repair Added-On (16 L.F. Max.) (Depth 8'-10') (Select Material paid Elsewhere) (051800)(21) per Each.

8"-12" Gravity Sewer Main Point Repair Added-On (16 L.F. Max.) (Depth 10'-12') (Select Material paid Elsewhere) (05180)(22) per Each.

8"-12" Gravity Sewer Main Point Repair Added-On (16 L.F. Max.) (Depth 12'-14') (Select Material paid Elsewhere) (05180)(23) per Each.

8"-12" Gravity Sewer Main Point Repair Added-On (16 L.F. Max.) (Depth 14'-16') (Select Material paid Elsewhere) (05180)(24) per Each.

15"-24" Gravity Sewer Main Point Repair Added-On (16 L.F. Max.) (Depth 0'-6') (Select Material paid Elsewhere) (05180)(25) per Each.

15"-24" Gravity Sewer Point Repair Added-On (16 L.F. Max.) (Depth 6'-8') (Select Material paid Elsewhere) (05180)(26) per Each.

15"-24" Gravity Sewer Main Point Repair Added-On (16 L.F. Max.) (Depth 8'-10') (Select Material paid Elsewhere) (05180)(27) per Each.

15"-24" Gravity Sewer Main Point Repair Added-On (16 L.F. Max.) (Depth 10'-12') (Select Material paid Elsewhere) (05180)(28) per Each.

15"-24" Gravity Sewer Main Point Repair Added-On (16 L.F. Max.) (Depth 12'-14') (Select Material paid Elsewhere) (05180)(29) per Each.

15"-24" Gravity Sewer Main Point Repair Added-On (16 L.F. Max.) (Depth 14'-16') (Select Material paid Elsewhere) (05180)(30) per Each.

27"-36" Gravity Sewer Main Point Repair Added-On (16 L.F. Max.) (Depth 0'-6') (Select Material paid Elsewhere) (05180)(31) per Each.

27"-36" Gravity Sewer Main Point Repair Added-On (16 L.F. Max.) (Depth 6'-8') (Select Material paid Elsewhere) (051800)(32) per Each.

27"-36" Gravity Sewer Main Point Repair Added-On (16 L.F. Max.) (Depth 8'-10') (Select Material paid Elsewhere) (05180)(33) per Each.

27"-36" Gravity Sewer Main Point Repair Added-On (16 L.F. Max.) (Depth 10'-12') (Select Material paid Elsewhere) (05180)(34) per Each.

27"-36" Gravity Sewer Main Point Repair Added-On (16 L.F. Max.) (Depth 12'-14') (Select Material paid Elsewhere) (05180)(35) per Each.

27"-36" Gravity Sewer Main Point Repair Added-On (16 L.F. Max.) (Depth 14'-16') (Select Material paid Elsewhere) (05180)(36) per Each.

- END OF SECTION -

SECTION 05190

GRAVITY SEWER MAIN REPLACEMENT

PART 1 - GENERAL

1.1 Scope: This Section covers gravity sewer main replacement, as authorized by ENGINEER, with conventional open cut installation of gravity sewer mains and appurtenances and includes all excavation, native material, excavation necessary to locate, evaluate and replace defective areas of the sewer lines and appurtenances, as well as all acceptance testing required by the Engineer. ("Select Material" for backfill measured and paid elsewhere).

1.2 Schedule of Repairs: The Engineer may amend the scope of work regarding gravity sewer main replacement as construction proceeds and where defective sections of pipe are discovered by direct visual observation.

1.3 Submittals: Submit product data in accordance with provisions of Section 03340 - Shop Drawings, Samples and Project Data.

1.4 Definitions: For the purposes of this Contract, the following terms will be defined as follows:

A. Main Line Removal and Replacement: Those repairs located on 8" diameter or larger gravity mains, which require excavation from the surface to accurately locate sources of infiltration and inflow and to eliminate them by making the necessary repair(s). This work requires removal and replacement of a section of pipe greater than twenty-six feet (26') in length. (Refer to Section 05180 – Gravity Sewer Main Point Repairs, 1.4 B, Main Line Point Repair, for derivation of 26' feet.

1.5 Measurement, Payment and Compensation: For the purposes of measurement, payment and compensation, it will be assumed that all repairs shall begin as either a "single source point repair" or a "main line point repair". Excavation and inspection will determine if the repair transforms to a "sewer main pipe replacement". When the replaced length of pipe exceeds 26', the repair will then be deemed a "sewer main pipe replacement". Once the length of replacement pipe exceeds 26' the initial 26' of deficient pipe shall be paid under the "main line point repair " pay item and associated excavation and native backfill pay items. The balance of pipe in excess of 26' shall be paid under the "Sewer Main Pipe Replacement" pay item.

PART 2 - PRODUCTS

2.1 Pipe and Fittings: Refer to Section 05110 - Gravity Sanitary Sewers and Appurtenances.

2.2 Bedding and Haunching.: Refer to Section 05110 - Gravity Sanitary Sewers and Appurtenances.

2.3 Initial and Final Backfill: Refer to Section 05110 - Gravity Sanitary Sewers and Appurtenances.

2.4 Couplings: Refer to Section 05110 - Gravity Sanitary Sewers and Appurtenances.

PART 3 - EXECUTION

3.1 Locating and Identifying the Defect: The locations of gravity sewer main replacement are shown on the Drawings and have been determined from the TV work. Additional gravity sewer main replacement work may be discovered while conducting other work under this contract, or as directed by the Engineer.

3.2 Remove and Replace Sewer Main: This work applies to situations where a reach of existing sewer line, greater than 26' in length, requires replacement. Replacement shall be accomplished by removing the existing pipe and installing new pipe in that same trench to the line and grade of the existing sewer, with the exception that sags or heaves shall be corrected.

3.3 Procedure: When the limits of a particular portion of the existing sewer line that is to be removed and replaced have been established on the ground, operations shall progress generally as follows:

A. The Contractor shall isolate the section or reach of pipe to be replaced by plugging and/or by-pass pumping.

B. The Contractor shall excavate down to the pipe, beginning at the downstream end of the designated reach or section of pipe to be replaced. The Contractor shall expose the reach or section of pipe to be replaced to the extent necessary. The Contractor shall remove and dispose of the existing pipe. All work shall be phased and coordinated so as to minimize public inconvenience.

C. The new pipe shall be installed and jointed, normally beginning at its low or outlet end and proceeding upstream, with the bell ends facing upstream toward the direction of flow. Pipe shall be laid on a uniform slope between the ends of existing pipe that remain in place. It is the Contractor's responsibility to set controls as necessary to attain true line and grade for the replacement pipe.

D. The Contractor shall install wyes or tees, with branches temporarily plugged, to make reconnections to existing services.

E. The Contractor shall make connections to existing manholes, cleanouts or pipe remaining in place.

F. The Contractor shall reconnect sewer service lines. Rebuild service risers (stacks) where necessary.

G. The Contractor shall conduct acceptance testing as required by the Engineer.

3.5 Surface Removal and Replacement: Refer to Section 07240 – Street Pavement Replacement and patching and related sub-sections.

3.6 Bypass Pumping: The section or reach of pipe to be replaced shall be isolated by plugging and/or by-pass pumping as outlined in Section 05230 - Gravity Sewer By-Pass Pumping.

3.7 Excavation, Native Backfill and Compaction: Installation and compaction of trench bedding and placement and compaction of native backfill ("select material" measured and paid elsewhere) shall be in accordance with Section 07150 - Excavation, Backfill and Compaction of Utility Trenches. Related work shall include, but not be limited to, de-watering trench as necessary to provide a safe and suitable working condition, and sheeting, shoring or bracing trench as deemed necessary to protect adjacent property and/or utilities, to prevent slides, cave-ins, settlement, or movement of banks and to maintain excavation clear of obstructions which would hinder or delay progress of work.

3.8 Installation: Installation shall be in accordance with Section 05110 - Gravity Sanitary Sewers and Appurtenances.

3.9 Completion: The Contractor shall reconnect sewer service lines and rebuild service risers where necessary. The Contractor shall keep careful record of the work done at each location, including photographs of completed repairs before backfilling, and shall submit the information to the Engineer.

3.10 Acceptance Testing: Prior to backfilling the excavation, the adequacy of repairs and replacements of sewer mains shall be demonstrated by the Contractor by employing smoke testing. Smoke Testing shall be in accordance with Specification Section 05150 - Smoke Testing. The repaired area shall be observed for the emergence of smoke for a period of ten (10) minutes. If none can be seen, the repair will be deemed to have passed the test. If the repaired area leaks smoke, the Contractor shall re-repair and retest at no expense to the Owner.

3.11 Pipe to Manhole Connections: This work is covered in Section 05250 – Miscellaneous Sewer Manholes Repair.

3.12 Boring and Jacking: Refer to Section 07170 – Boring and Jacking – Casing, Pipe and Service Tubing.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Remove and Replace Sewer Main:

A. Measurement: Removal and replacement of sewer main will be measured by the linear foot along the ridge of the replacement pipe installed and accepted. Work will be classified by pipe size and depth. Depth will be determined by measuring the vertical distance between the pipe invert and the existing ground or pavement surface.

B. Payment: Payment for removal and replacement of sewer main, measured as above, will be paid at the Contract unit price per Linear Foot, will provide complete compensation for excavation; trench protection; pumping and bailing; removal and disposal of existing pipe and encasement if any; furnishing and installing new pipe; replacement of sewer risers as encountered; closure with pipe remaining in place, connection or reconnection to existing sewer lines including bends, couplings, banded adapters, miscellaneous fittings, as required; testing; native backfill and compaction; cleanup; labor, tools and equipment; and all incidentals not noted to be separate pay items. Removal and replacement of paved surfaces will be paid as separate items.

C. Pay Item:

Remove and Replace (8") Sewer Main with D3034 PVC (SDR26) (0-6 Feet Deep) ("Select Material" Paid Elsewhere) (05190)(01) per Linear Foot.

Remove and Replace (8") Sewer Main with D3034 PVC (SDR26) (6-8 Feet Deep) ("Select Material" Paid Elsewhere) (05190)(02) per Linear Foot.

Remove and Replace (8") Sewer Main with D3034 PVC (SDR26) (8-10 Feet Deep) ("Select Material" Paid Elsewhere) (05190)(03) per Linear Foot.

Remove and Replace (8") Sewer Main with D3034 PVC (SDR26) (10-12 Feet Deep) ("Select Material" Paid Elsewhere) (05190)(04) per Linear Foot.

Remove and Replace 10" Sewer Main with D3034 PVC (SDR 26) (0-6 Deep) ("Select Material" Paid Elsewhere) (05190)(05) per Linear Foot.

Remove and Replace 10" Sewer Main with D3034 PVC (SDR 26) (6-8 Deep) ("Select Material" Paid Elsewhere) (05190)(06) per Linear Foot.

Remove and Replace 10" Sewer Main with D3034 PVC (SDR 26) (8-10 Deep) ("Select Material" Paid Elsewhere) (05190)(07) per Linear Foot.

Remove and Replace 10" Sewer Main with D3034 PVC (SDR 26) (10-12 Deep) ("Select Material" Paid Elsewhere) (05190)(08) per Linear Foot.

Remove and Replace 12" Sewer Main with D3034 PVC (SDR 26) (0-6 Deep) ("Select Material" Paid Elsewhere) (05190)(09) per Linear Foot.

Remove and Replace 12" Sewer Main with D3034 PVC (SDR 26) (6-8 Deep) ("Select Material" Paid Elsewhere) (05190)(10) per Linear Foot.

Remove and Replace 12" Sewer Main with D3034 PVC (SDR 26) (8-10 Deep) ("Select Material" Paid Elsewhere) (05190)(11) per Linear Foot.

Remove and Replace 12" Sewer Main with D3034 PVC (SDR 26) (10-12 Deep) ("Select Material" Paid Elsewhere) (051900)(12) per Linear Foot.

Remove and Replace 15" Sewer Main with D3034 PVC (SDR 26) (0-6 Deep) ("Select Material" Paid Elsewhere) (05190)(13) per Linear Foot.

Remove and Replace 15" Sewer Main with D3034 PVC (SDR 26) (6-8 Deep) ("Select Material" Paid Elsewhere) (05190)(14) per Linear Foot.

Remove and Replace 15" Sewer Main with D3034 PVC (SDR 26) (8-10 Deep) ("Select Material" Paid Elsewhere) (051900)(15) per Linear Foot.

Remove and Replace 15" Sewer Main with D3034 PVC (SDR 26) (10-12 Deep) ("Select Material" Paid Elsewhere) (05190)(16) per Linear Foot.

- END OF SECTION -

SECTION 05210

GRAVITY SEWER SERVICE POINT REPAIRS

PART 1 - GENERAL

1.1 Scope: This Section covers gravity sewer service point repairs as authorized by ENGINEER and includes all excavation, native excavation necessary to locate, evaluate and replace defective areas of the sewer services, as well as all acceptance testing required by the ENGINEER. All work shall be performed by an experienced plumber, capable of determining a professional solution, implementing the solution, all to result in a sound, solid and water tight repair. Although it is the intent of this project to replace all sewer service assemblies including main line wye and eighth bend, service pipe, cleanouts, and connections to the existing service pipe, it is envisioned that some of the existing services, or portions thereof, shall remain intact. If sewer service repairs are required on these existing services to remain intact, that work will be conducted in accordance with this Specification section.

1.2 Schedule of Repairs: The ENGINEER may amend the scope of work regarding gravity sewer service repair and replacement as construction proceeds and where defective sections of pipe are discovered by direct visual observation.

1.3 Submittals: Submit product data in accordance with provisions of Section 03340 - Shop Drawings, Samples and Project Data.

1.4 Definitions: For the purposes of this Contract, the following terms will be defined as follows:

A. Single Source Service Line Point Repair: Those repairs located on 4" or 6" diameter sewer service lines, which require excavation from the surface to accurately locate sources of infiltration and inflow and to eliminate them by making the necessary repair(s). This work requires sealing or closing an opening in pipe or fitting(s) which shall remain in place. These repairs are accomplished with wrap-around repair sleeves or couplings or the removal and replacement of a section of pipe less than three (3') in length.

B. Service Line Point Repair: Those repairs located on 4" or 6" diameter sewer service lines, which require excavation from the surface to accurately locate sources of infiltration and inflow and to eliminate them by making the necessary repair(s). This work requires removal and replacement of a section of pipe greater than three (3') in length but less than sixteen feet (16'), which is the nominal length of one (1) new joint of PVC ASTM D 3034 pipe. Extensions to service line point repairs include extending the excavation in one or both directions by 6' and extending the service line point repair in one or both directions by 4'. The maximum pay length for excavation for service line point repair is 28' (16' + 6' + 6'). The maximum pipe pay length for service line point repair is 26' (2' less than maximum trench length).

1.5 Measurement, Payment and Compensation: For the purposes of measurement, payment and compensation, it will be assumed that all repairs shall begin as either a "single source service line point repair" or a "service line point repair". Excavation and inspection will determine if the repair transforms to a "sewer service line replacement". When the replaced length of pipe exceeds 26', the repair will then be deemed a "sewer service line replacement". Once the length of

replacement pipe exceeds 26' the initial 26' of deficient pipe shall be paid under the "service line point repair" pay item. The balance of pipe in excess of 26' shall be paid under the "sewer main pipe replacement" pay item.

PART 2 - PRODUCTS

2.1 Pipe and Fittings: Refer to Section 05110 - Gravity Sanitary Sewers System and Related Appurtenances.

2.2 Bedding and Haunching: Refer to Section 05110 - Gravity Sanitary Sewers System and Related Appurtenances.

2.3 Initial and Final Backfill: Refer to Section 05110 - Gravity Sanitary Sewers System and Related Appurtenances.

2.4 Couplings: Refer to Section 05110 - Gravity Sanitary Sewers System and Related Appurtenances.

2.5 Saddles: Saddles used to connect new or replaced services to existing gravity mains shall be composed of an adjustable stainless steel strap (Type 304, ASTM A240), a ductile iron saddle casting (ASTM 536, Grade 65-45-12), a gasket (SBR per ASTM D2000 MBA710). Saddles shall be Style "CB" sewer saddle as manufactured by Romac Industries, Inc., Fernco, or approved equal.

PART 3 - EXECUTION

3.1 Locating and Identifying the Defect:

A. Locations where point repairs are to be made are to be determined by the CONTRACTOR and the ENGINEER.

B. The CONTRACTOR shall verify the location of proposed excavation with ENGINEER.

C. The CONTRACTOR shall excavate and expose a sixteen (16') foot section of pipe centered upon the suspected defect location.

D. The CONTRACTOR shall locate the leak to be repaired.

E. After the leak or failure is located and exposed within the sixteen (16') foot section of pipe, the ENGINEER shall examine the defect and verify with the ENGINEER as to the method and extent of repairs.

3.2 Single Source Service Line Point Repair:

A. The CONTRACTOR shall seal or close the opening in pipe(s) or fitting(s) to remain in place with wrap-around repair sleeves or couplings per standard industry practice and approved by the ENGINEER.

B. If the failure is such that a portion of failed pipe must be removed and replaced, but said portion of pipe does not exceed three (3') in length, the CONTRACTOR shall remove section(s) of defective pipe and/or fitting by cutting on each side along lines perpendicular to the longitudinal axis of the pipe so as to leave "spigot ends" to be connected to replacement pipe. The CONTRACTOR shall fabricate a replacement section including replacements for any wyes, tees or other existing fittings encountered. Any branch fittings shall be temporarily plugged. The CONTRACTOR shall install the replacement section and make connections to adjacent pipe ends using approved couplings.

3.3 Service Line Point Repair: If the failure is such that a failed pipe must be removed and replaced and said portion of pipe exceeds three (3') foot in length, the CONTRACTOR shall remove section(s) of defective pipe and/or fitting by cutting on each side along lines perpendicular to the longitudinal axis of the pipe so as to leave "spigot ends" to be connected to replacement pipe. The CONTRACTOR shall fabricate a replacement section including replacements for any wyes, tees or other existing fittings encountered. Any branch fittings shall be temporarily plugged. The CONTRACTOR shall install the replacement section and make connections to adjacent pipe ends using approved couplings.

3.4 Extension of Point Repair of Service Line: The ENGINEER may direct the CONTRACTOR to extend the excavation in six (6') foot increments in a specified direction if the following conditions are found:

- The defect is not found in the initial sixteen (16') foot section of service line.
- The defect continues past the limits of the initial sixteen (16') foot section of service line.

The CONTRACTOR shall not extend excavation to uncover additional pipe without the ENGINEER's approval. Each additional six (6') foot increment shall require approval by the ENGINEER.

3.5 Remove and Replace Sewer Service Line Under Drainage Structure: Where a defect in service line lies under a storm drainage structure or other such obstacle that is to remain in place, the CONTRACTOR shall excavate on both sides of the structure and remove the section of faulty pipe by cutting and drawing out. The drainage structure shall remain undisturbed. Replacement pipe shall be ductile iron, installed by bore or other such means. Connections shall be made with devices designed and approved for the application.

3.6 Plug Abandoned Service Lines: Where it is determined that an abandoned sewer service line should be plugged, the CONTRACTOR shall search, locate and remove all abandoned piping within public easement or right-of-way, except for any portion under roadway, and plug the service line at the public easement or right-of-way line. The portion under the road shall be closed by placing approximately one cubic foot of concrete in it to form a water-tight plug at each end. Refer to Section 07330 – Cast-In-Place Concrete.

3.7 Disconnect Storm Drain Lines: Where it is suspected that a storm drainage line (from yard drain, parking lot, etc.) is connected to the sanitary sewer system, the CONTRACTOR shall search, locate and remove all illegal piping within public easement or right-of-way, except for any portion under roadway. The portion under the road shall be closed by placing approximately one cubic foot of concrete in it to form a water-tight plug at each end. Refer to Section 07330 – Cast-In-Place Concrete.

3.8 Disconnect Roof Gutter/Downspout: Where a roof gutter or downspout is connected to a sewer service system (typically at an external vent stack), the CONTRACTOR shall remove the illegal connection. CONTRACTOR shall satisfactorily plug/patch the vent stack or other former connection point.

3.9 Replace Private Sewer Cleanout: This item includes all work required to replace an existing sewer cleanout installation located on private property to eliminate leaks. The type of material shall be PVC. Where directed by the OWNER, the CONTRACTOR shall make such repairs or replacement.

3.10 Replace Public Sewer Cleanout: This item includes all work required to replace an existing sewer cleanout installation located on public property to eliminate infiltration leaks. The type of material shall be cast iron. Where directed by the ENGINEER, the CONTRACTORS shall make such repairs or replacement.

3.11 Replace Missing Cleanout Covers: Missing or defective cleanout covers or plugs shall be replaced with new covers or plugs of the size and type required to properly fit the cleanout.

3.12 Replace Crushed, Broken or Missing Fittings: Crushed, broken or missing fittings shall be replaced with new fittings of size and type required to properly fit the service line.

3.13 Re-Attachment of Separated Joints or Fittings: Separated joints or fittings shall be re-attached and properly sealed to avoid infiltration leaks.

3.14 Re-Plumbing for Watertight Connection of House Service to Service Line: Connection of house service to service line shall be inspected and if leaks are found, shall be re-plumbed to seal the connection from infiltration.

3.15 Surface Removal and Replacement: Refer to Section 07240 – Street Pavement Replacement and Patching and related sub-sections.

3.16 Bypass Pumping: Refer to Section 05230 - Gravity Sewer By-Pass Pumping.

3.17 Excavation, Native Backfill and Compaction: Refer to Section 07150 - Excavation, Backfill and Compaction of Utility Trenches.

3.18 Installation: Installation shall be in accordance with Section 05110 - Gravity Sanitary Sewers System and Related Appurtenances.

3.19 Completion: The CONTRACTOR shall reconnect sewer service lines and rebuild service risers where necessary. The CONTRACTOR shall keep careful record of the work done at each location, including photographs of completed repairs before backfilling, and shall submit the information to the ENGINEER.

3.20 Acceptance Testing: Prior to backfilling the excavation, the adequacy of repairs and replacements of sewer mains shall be demonstrated by the CONTRACTOR by employing smoke testing. Smoke Testing shall be in accordance with Specification Section 05150 - Smoke Testing. The repaired area shall be observed for the emergence of smoke for a period of ten (10) minutes. If none can be seen, the repair will be deemed to have passed the test. If the repaired area leaks

smoke, the CONTRACTOR shall re-repair and retest at no expense to the OWNER.

3.21 Pipe to Manhole Connections: Refer to Section 05250 – Miscellaneous Sewer Manhole Repairs.

3.22 Work on Private Property: The CONTRACTOR shall verify with the OWNER, the locations of any and all work on private property prior to performing work. The CONTRACTOR will not be paid for unauthorized work on private property.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Single Source Service Line Point Repair:

A. Measurement: Single Source Service Line Point Repairs will be measured by the actual number of repairs completed and accepted. Point repairs will be classified by pipe size. All repair work that is performed within a single excavation that exposes up to sixteen (16') feet of pipe will be considered part of a single point repair. Maximum pipe length covered under this item is 3'.

B. Payment: Single Source Service Line Point Repairs, placed and accepted, measured as provided above, will be paid at the contract unit price per each for the particular size and type stated, which price and payment shall constitute full compensation for furnishing all materials, equipment, tools, labor, hauling, traffic control, signs, barricades, safety items and incidentals necessary to complete this item in accord with the Drawings and Specifications.

C. Pay Item:

4" Single Source Service Line Point Repairs ("Select Material" Paid Elsewhere) (05210)(01) per Each.

6" Single Source Service Line Point Repairs ("Select Material" Paid Elsewhere) (05210)(02) per Each.

4.2 Service Line Point Repair:

A. Measurement: Service Line Point Repairs will be measured by the linear foot horizontally along the centerline from end to end of new pipe. Service line point repairs will be classified by pipe size. All repair work that is performed within a single excavation that exposes up to sixteen (16') feet of pipe will be considered part of a single point repair. Pipe lengths covered under this item range from 3' to 14'. Authorized extension of excavation and repair beyond the specified length shall be considered under Pay Item "Extension of Point Repair on Service Line" described elsewhere in this Section.

B. Payment: Service Line Point Repairs, placed and accepted, measured as provided above, will be paid at the contract unit price per linear foot for the particular size and type stated, which price and payment shall constitute full compensation for furnishing all materials, equipment, tools, labor, hauling, traffic control, signs, barricades, safety items and incidentals necessary to complete this item in accord with the Drawings and

Specifications.

C. Pay Item:

16 L.F. 4" Sewer Service Line Point Repairs (05210)(03) per Each.

16 L.F. 6" Sewer Service Line Point Repairs (05210)(04) per Each.

4.3 Extension of Point Repair on Service Lines:

A. Measurement: Extension of Point Repair of Service Lines will be measured by the linear foot completed and accepted. Extension of Point Repair on Service Lines will be classified by pipe size.

B. Payment: Extension of Point Repair of Service Lines, placed and accepted, measured as provided above, will be paid at the contract unit price per linear foot for the particular size and type stated, which price and payment shall constitute full compensation for furnishing all materials, equipment, tools, labor, hauling, traffic control, signs, barricades, safety items and incidentals necessary to complete this item in accord with the Specifications.

C. Pay Item:

Extension of Point Repair of 4" Sewer Service Lines) (Select material Paid Elsewhere) (05210)(05) per Linear Foot.

Extension of Point Repair of 6" Sewer Service Line (Select material Paid Elsewhere) (05210)(06) per Linear Foot.

4.4 Disconnect Storm Drainage Lines:

A. Measurement: Disconnection of existing 4" -6" yard storm drain lines from existing sewer main or service will be measured and paid for at the unit price per each regardless of pipe size.

B. Payment: This item, performed and accepted, measured as provided above, will be paid at the Contract Unit Price per each. Such payment will provide complete compensation for all work required to locate, cut and plug an unauthorized storm drainage line as described in these Specifications.

C. Pay Item: Disconnect Yard Storm Drainage Lines (4"-6") From Existing Sewer Main or Service (05210)(07) per each.

4.5 Disconnect Roof Gutter/Downspout:

A. Measurement: This item will be measured and paid for at the unit price per each regardless of pipe size.

B. Payment: This item, performed and accepted, measured as provided above, will be paid at the Contract Unit Price per each. Such payment will provide complete

compensation for all work required to locate, cut and plug an unauthorized storm drainage line as described in these Specifications.

C. Pay Item: Disconnect Roof Gutter/Downspout (05210)(08) per Each.

4.6 Replace Sewer Cleanout:

A. Measurement: This item will be measured at the unit price per each

B. Payment: This item, placed and accepted, measured as provided above, will be paid at the contract unit price per each for the particular size and type stated, which price and payment shall constitute full compensation for all work required to rehabilitate a cleanout as described in these Specifications.

C. Pay Item:

Replacement of 4" Cast Iron Public Sewer Cleanout (05210)(09) per Each.

Replacement of 4" PVC Private Sewer Cleanout (052100)(10) per Each.

Replacement of 6" Cast Iron Public Sewer Cleanout (052100)(11) per Each.

Replacement of 6" PVC Private Sewer Cleanout (05210)(12) per Each.

4.7 Replace Missing Cleanout Covers or Plugs:

A. Measurement: This item will be measured per each item installed.

B. Payment: This item, performed and accepted, measured as provided above will be paid at the Contract Unit Price per each. Such payment will provide complete compensation for all work required to Replace Missing Cleanout Covers or Plugs as described in these Specifications.

C. Pay Item: Replace Missing Cleanout Covers or Plugs (05210)(13) per Each.

4.8 Replace Crushed, Broken or Missing Fittings:

A. Measurement: This item will be measured per each item installed.

B. Payment: This item, performed and accepted, measured as provided above will be paid at the Contract Unit Price per each. Such payment will provide complete compensation for all work required to Replace Crushed, Broken or Missing Fittings as described in these Specifications.

C. Pay Item: Replace Crushed, Broken or Missing Fittings (4" / 6") (05210)(14) per Each.

4.9 Re-Attach Separated Joints of Fittings:

A. Measurement: This item will be measured per each item installed.

B. Payment: This item, performed and accepted, measured as provided above will be paid at the Contract Unit Price per each. Such payment will provide complete compensation for all work required to Re-attach Separated Joints or Fittings as described in these Specifications.

C. Pay Item: Re-Attach Separated Joints or Fittings (05210)(15) per Each.

4.10 Re-Plumb for Watertight Connection of House Service to Service Line:

A. Measurement: This item will be measured per each item installed.

B. Payment: This item, performed and accepted, measured as provided above will be paid at the Contract Unit Price per each. Such payment will provide complete compensation for all work required to Re-Plumb for Watertight Connection of House Service to Service Line as described in these Specifications.

C. Pay Item: Re-Plumb for Watertight Connection of House Service to Service Line (05210)(16) per Each.

4.11 Connect to Existing Sewer Service:

A. Measurement: Connection to Existing Sewer Service consisting of the stated size and type components, satisfactorily completed and accepted as Specified, as shown on the Drawings or as Directed, shall be measured by a count of each type installed. The unit for each shall include furnishing and installing all required fittings, pipe, native backfill materials and other required components.

B. Payment: Connection to Existing Sewer Service, in place and accepted, measured as provided above, will be paid at the Contract unit price per Each, which price and payment shall constitute full compensation for furnishing all materials, equipment, tools, labor, hauling, traffic control, signs, barricades, safety items and incidentals necessary to complete this item in accordance with the Drawings and Specifications.

C. Pay Item:

Connect to Existing Sewer Service with 4" Coupling (Including Native Backfill, Compaction, Etc.) ("Select Material" Paid Elsewhere) (05210)(17) per Each.

Connect to Existing Sewer Service with 6" Coupling (Including Native Backfill, Compaction, Etc.) ("Select Material" Paid Elsewhere) (05210)(18) per Each.

- END OF SECTION -

SECTION 05220

GRAVITY SEWER SERVICE LINE REPLACEMENT

PART 1 - GENERAL

1.1 Scope: This Section covers gravity sewer service line replacement, as authorized by ENGINEER, with conventional open cut installation of gravity sewer service pipe and appurtenances and includes all excavation, native backfilling, necessary to locate, evaluate and replace defective areas of the sewer service lines and appurtenances, as well as all acceptance testing required by the ENGINEER.

1.2 Schedule of Repairs: The ENGINEER may amend the scope of work regarding gravity sewer service line replacement as construction proceeds and where defective sections of pipe are discovered by direct visual observation.

1.3 Submittals: Submit product data in accordance with provisions of Section 03340 - Shop Drawings, Samples and Project Data.

1.4 Definitions: For the purposes of this Contract, the following terms will be defined as follows:

A. Service Line Removal and Replacement: Those repairs located on 4" and 6" service lines, which require excavation from the surface to accurately locate sources of infiltration and inflow and to eliminate them by making the necessary repair(s). This work requires removal and replacement of a section of pipe greater than twenty-six feet (26') in length. (Refer to Section 05180 – Gravity Sewer Main Point Repairs, 1.4 B, Main Line Point Repair, for derivation of 26' feet.

1.5 Measurement, Payment and Compensation: For the purposes of measurement, payment and compensation, it will be assumed that all repairs shall begin as either a "single source service line point repair" or a "service line point repair". Excavation and inspection will determine if the repair transforms to a "sewer service line replacement". When the replaced length of pipe exceeds 26', the repair will then be deemed a "sewer service line replacement". Once the length of replacement pipe exceeds 26', the initial 26' of deficient pipe shall be paid under the "Service Line Point Repair" pay item and associated excavation and embankment pay items. The balance of pipe in excess of 26' shall be paid under the "Sewer Main Pipe Replacement" pay item.

PART 2 - PRODUCTS

2.1 Pipe and Fittings: Refer to Section 05110 - Gravity Sanitary Sewers System and Related Appurtenances.

2.2 Bedding and Haunching: Refer to Section 05110 - Gravity Sanitary Sewers System and Related Appurtenances.

2.3 Initial and Final Backfill: Refer to Section 05110 - Gravity Sanitary Sewers System and Related Appurtenances.

2.4 Couplings: Refer to Section 05110 - Gravity Sanitary Sewers System and Related Appurtenances.

PART 3 - EXECUTION

3.1 Locating and Identifying the Defect: The locations of gravity sewer service line replacement are shown on the Drawings and have been determined from the TV work. Additional gravity sewer service line replacement work may be discovered while conducting other work under this contract, or as directed by the ENGINEER.

3.2 Remove and Replace Service Line: This work applies to situations where a reach of existing sewer service line, greater than 26' in length, requires replacement. Replacement shall be accomplished by removing the existing pipe and installing new pipe in that same trench to the line and grade of the existing sewer service line, with the exception that sags or heaves shall be corrected.

3.3 Procedure: When the limits of a particular portion of the existing sewer service line that is to be removed and replaced have been established on the ground, operations shall progress generally as follows:

A. The CONTRACTOR shall isolate the section or reach of pipe to be replaced by plugging and/or by-pass pumping.

B. The CONTRACTOR shall excavate down to the pipe, beginning at the downstream end of the designated reach or section of pipe to be replaced. The CONTRACTOR shall expose the reach or section of pipe to be replaced to the extent necessary. The CONTRACTOR shall remove and dispose of the existing pipe. All work shall be phased and coordinated so as to minimize public inconvenience.

C. The new pipe shall be installed and jointed, normally beginning at its low or outlet end and proceeding upstream, with the bell ends facing upstream toward the direction of flow. Pipe shall be laid on a uniform slope between the ends of existing pipe that remain in place. It is the CONTRACTOR's responsibility to set controls as necessary to attain true line and grade for the replacement pipe.

D. The CONTRACTOR shall make connections to existing manholes, cleanouts or pipe remaining in place.

E. The CONTRACTOR shall conduct acceptance testing as required by the ENGINEER.

3.5 Surface Removal and Replacement: Refer to Section 07240 – Street Pavement Replacement and patching and related sub-sections.

3.6 Bypass Pumping: Refer to Section 05230 – Gravity Sewer By-Pass Pumping.

3.7 Excavation, Native Backfill and Compaction: Refer to Section 07150 - Excavation, Backfill and Compaction of Utility Trenches.

3.8 Installation: Installation shall be in accordance with Section 05110 - Gravity Sanitary Sewers System and Related Appurtenances.

3.9 Completion: The CONTRACTOR shall reconnect sewer service lines and taps where necessary. The CONTRACTOR shall keep careful record of the work done at each location, including photographs of completed repairs before backfilling, and shall submit the information to the ENGINEER.

3.10 Acceptance Testing: Prior to backfilling the excavation, the adequacy of repairs and replacements of sewer service lines shall be demonstrated by the CONTRACTOR by employing smoke testing. Smoke Testing shall be in accordance with Specification Section 05150 - Smoke Testing. The repaired area shall be observed for the emergence of smoke for a period of ten (10) minutes. If none can be seen, the repair will be deemed to have passed the test. If the repaired area leaks smoke, the CONTRACTOR shall re-repair and retest at no expense to the OWNER.

3.11 Pipe to Manhole Connections: This work is covered in Section 05250 – Miscellaneous Sewer Manhole Repairs.

3.12 Boring and Jacking: Refer to Section 05170 – Boring and Jacking – Casing, Pipe and Service Tubing.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Remove and Replace Sewer Service Line:

A. Measurement: Removal and replacement of sewer service line will be measured by the linear foot along the ridge of the replacement pipe installed and accepted. Work will be classified by pipe size and depth. Depth will be determined by measuring the vertical distance between the pipe invert and the existing ground or pavement surface.

B. Payment: Payment for removal and replacement of sewer service line will provide complete compensation for excavation; trench protection; pumping and bailing; removal and disposal of existing pipe and encasement if any; furnishing and installing new pipe; replacement of sewer risers as encountered; closure with pipe remaining in place, connection or reconnection to existing sewer lines including bends, couplings, banded adapters, miscellaneous fittings, as required; testing; native backfill and compaction; cleanup; labor, tools and equipment; and all incidentals not noted to be separate pay items. Removal and replacement of paved surfaces will be paid as separate items.

C. Pay Item:

Remove and Replace (4") Sewer Service Line with D3034 PVC (SDR26) (0-6 Feet Deep) ("Select Material" Paid Elsewhere) (05220)(01) per Linear Foot.

Remove and Replace (4") Sewer Service Line with D3034 PVC (SDR26) (6-8 Feet Deep) ("Select Material" Paid Elsewhere) (05220)(02) per Linear Foot.

Remove and Replace (4") Sewer Service Line with D3034 PVC (SDR26) (8-10 Feet Deep) ("Select Material" Paid Elsewhere) (05220)(03) per Linear Foot.

Remove and Replace (4") Sewer Service Line with D3034 PVC (SDR26) (10-12 Feet Deep) ("Select Material" Paid Elsewhere) (05220)(04) per Linear Foot.

Remove and Replace (4") Sewer Service Line with D3034 PVC (SDR26) (12-14 Feet Deep) ("Select Material" Paid Elsewhere) (05220)(05) per Linear Foot.

Remove and Replace (6") Sewer Service Line with D3034 PVC (SDR26) (0-6 Feet Deep) ("Select Material" Paid Elsewhere) (05220)(06) per Linear Foot.

Remove and Replace (6") Sewer Service Line with D3034 PVC (SDR26) (6-8 Feet Deep) ("Select Material" Paid Elsewhere) (05220)(07) per Linear Foot.

Remove and Replace (6") Sewer Service Line with D3034 PVC (SDR26) (8-10 Feet Deep) ("Select Material" Paid Elsewhere) (05220)(08) per Linear Foot.

Remove and Replace (6") Sewer Service Line with D3034 PVC (SDR26) (10-12 Feet Deep) ("Select Material" Paid Elsewhere) (05220)(09) per Linear Foot.

Remove and Replace (6") Sewer Service Line with D3034 PVC (SDR26) (12-14 Feet Deep) ("Select Material" Paid Elsewhere) (05220)(10) per Linear Foot.

- END OF SECTION -

SECTION 05230

GRAVITY SEWER BY-PASS PUMPING

PART 1 - GENERAL

1.1 Scope:

A. It shall be the responsibility of the CONTRACTOR to provide the necessary equipment, materials, labor, and supervision for pumping/bypassing of sewer flow as may be required for the work including manhole repair, point repairs, pipe replacement, service work, etc. Flow control shall be used at the discretion of the CONTRACTOR or as directed by the ENGINEER for proper execution of the task at hand.

B. It shall be the responsibility of the CONTRACTOR to make provisions to meet all requirements of these Specifications and to correct any problems which may arise as a result of the pumping operations.

C. When an area of the existing sewer system is being rehabilitated or repaired, the flow shall be rerouted by pumping or bypassing of the flow and plugging or blocking of the flow.

D Operation of the existing portion of the sewer system being repaired will be the responsibility of the CONTRACTOR once he has taken control of the particular section of sewer.

1.2 Notification: The CONTRACTOR shall notify the ENGINEER 48 hours in advance of shutting down the existing pumping equipment and if requested, CONTRACTOR shall demonstrate that the bypass pumping system is operable before dismantling the existing pump equipment.

PART 2 - PRODUCTS

2.1 Equipment: All pumps, piping, valves, temporary controls, hosing, vehicles, connections, fuel generators, clamps, couplings, adapters, etc. will be provided by the CONTRACTOR to perform and complete by-pass set-up and pumping as directed by the ENGINEER.

PART 3 - EXECUTION

3.1 Pumping and Bypassing:

A. When pumping and bypassing is required, the CONTRACTOR shall provide the necessary materials, pumps, conduits, and other equipment to divert sewer flows around the areas of rehabilitation or repair work. The bypass system shall be capable of sufficient capacity to handle existing flows plus additional flow that may occur during periods of rainfall. After the rehabilitation or repair work has been completed, flows shall be restored to normal.

B. The CONTRACTOR shall be responsible for furnishing the necessary power, labor, and supervision to set up and operate the pumping and bypassing system. If pumping is to occur on a 24 hour basis, the equipment shall be operated in a manner which will keep the pump noise at a minimum.

C. Bypassing sanitary sewer flows into storm drainage systems is illegal and will not be allowed.

D. Any bypass pumping system used by the CONTRACTOR shall include an automatic control system to operate the pumps during hours where CONTRACTOR'S personnel are not on site.

3.2 Plugging or Blocking: A sewer line plug shall be inserted into the line at a manhole upstream from the manhole or sewer line being diverted. The plug shall be designed so that all or any portion of the sewage flows can be released.

3.3 Flow Control Precautions: Whenever flows in a sewer line are blocked, plugged, or bypassed, sufficient precautions shall be taken to protect the sewer lines from damage that might be inflicted by excessive sewer surcharging. Further, precautions shall be taken to ensure that sewer flow control operations do not cause backflow, flooding or damage to adjacent property. Should flooding or damage occur due to unsuitable sewer flow control, the CONTRACTOR shall be responsible for clean-up, repair, property damage costs and claims.

3.4 On-Call Personnel: CONTRACTOR shall provide OWNER and ENGINEER with name, address, telephone number, etc. of his personnel who will be on 24-hour call in the event of a failure of the bypass pumps.

3.5 By-Pass Pumping Set-Up: The CONTRACTOR shall provide adequate pumping equipment and temporary bypass lines as required to pass sewage flow at peak flow conditions. Under no circumstances shall flow be interrupted or stopped. The locations of the pumps, bypass lines and discharge points shall be approved by the ENGINEER. The bypass shall be made by plugging the gravity sewer at an upstream manhole and pumping the flow into a downstream manhole or adjacent system.

3.6 By-Pass Pumping: The CONTRACTOR shall provide adequate pumping equipment and temporary bypass lines as required to pass sewage flow at peak flow conditions. Under no circumstances shall flow be interrupted or stopped. The locations of the pumps, bypass lines and discharge points shall be approved by the ENGINEER.

PART 4 - MEASUREMENT AND PAYMENT

4.1 By-Pass Pumping Set-Up:

A. Measurement: By-pass pumping set-up, of the various pump sizes, types and set-ups, including excavation and native backfill, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Each successfully set-up.

B. Payment: By-pass pumping set-up, measured as provided above, will be paid at the Contract unit price per Each for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere) (Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere) (Pavement Repair or Replacement Paid Elsewhere) (Select Backfill Paid Elsewhere) (Traffic Control Paid Elsewhere).

C. Pay Item:

By-Pass Pumping Set-Up (4" Pump) (05230)(01) per Each

By-Pass Pumping Set-Up (6" Pump) (05230)(02) per Each

By-Pass Pumping Set-Up (8" Pump) (05230)(03) per Each

By-Pass Pumping Set-Up (10" Pump) (05230)(04) per Each

By-Pass Pumping Set-Up (12" Pump) (05230)(05) per Each

4.2 By-Pass Pumping:

A. Measurement: By-pass pumping, of the various size pumps, including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per 12 hours of pumping.

B. Payment: By-pass pumping, measured as provided above, will be paid at the Contract unit price per 8 hour/day of Pumping for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices.

C. Pay Item:

By-Pass Pumping (4" Pump) (05230)(06) per 8 Hour Day

By-Pass Pumping (6" Pump) (05230)(07) per 8 Hour Day

By-Pass Pumping (8" Pump) (05230)(08) per 8 Hour Day

By-Pass Pumping (10" Pump) (05230)(09) per 8 Hour Day

By-Pass Pumping (12" Pump) (05230)(10) per 8 Hour Day

- END OF SECTION -

SECTION 05240

SEWER MANHOLE INSPECTION

PART 1 - GENERAL

1.1 Scope: This Section covers the requirements for the inspection of sewer manholes by manual means, 3D manhole assessment, structural manhole assessment, etc., including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and/or as directed by the ENGINEER.

1.2 Assessment: The purpose of manhole inspection is to determine the physical condition, location and possible sources of infiltration and inflow in the manholes. Information obtained during the physical survey will be utilized in determining rehabilitation cost and methods.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 Inspection Procedures:

A. The manhole inspection shall be carried out using hand held equipment from the ground surface incorporating high level illumination and a digital camera or similarly approved technology which shall have an intensity of light and picture quality sufficient to convey all required information in a clear and distinguishable manner. Information gathered shall provide a full illustrative account of the manhole's interior, including all defects as well as each pipeline entering the manhole. CONTACTOR to complete the attached "Manhole Inspection Form" for each manhole inspected.

B. Manholes that are 12 feet deep and greater and/or manholes with any pipe 36 inches in diameter and greater or with offset manholes, overflow weirs, or other unique features precluding effective ground level inspection will be inspected as follows:

1. The CONTRACTOR shall manually carry out each manhole inspection by descending each manhole to determine the dimensional configuration and physical condition of the base, channel(s), barrel, corbel, connections, cone, ring and cover of the structure and locate possible sources of infiltration and inflow. The arrangement in the manhole shall be characterized with a drawing that shall indicate the invert and direction of flow. The "Manhole Inspection Form" attached to this specification shall be used by the CONTRACTOR to record all manhole inspection data, including map verification, assessment log and record map concerns as necessary.

2. The manhole interior structure shall be manually inspected using high—level illumination. High-resolution digital photographs with approved picture quality shall be taken of observed defects as well as all other relevant features.

Information gathered shall provide a full illustration of the condition of the manholes interior as well as each pipeline entering the manhole.

3.2 Documentation: Record all information on the attached "Manhole Inspection Form" attached to this Section.

3.3 Photographic Documentation Procedures:

A. A set of high-resolution digital color photographs shall be taken for each manhole inspected, showing:

1. Above ground features and conditions in the vicinity of the manhole. Photograph to be taken looking downstream with manhole in immediate foreground.

2. Plan view from surface, of manhole invert - photographers feet placed on location of outgoing pipe.

3. Elevation view of each incoming and outgoing sewers.

4. All observed defects and obstructions.

B. Groups of digital photographs for each designated manhole orientated so that the long side of the photograph is horizontal and shall be incorporated in the hard copy of the inspection form and shall also be supplied on a CD-ROM(s) incorporated for each work task order issued by the ENGINEER unless otherwise directed.

C. The annotation for each photograph shall be clearly visible and shall have a 12 pt (uppercase) font size. Reference to location of each photograph shall be indicated on the inspection form. Photographs taken within the manhole shall indicate depth below ground surface and clock reference, relative to North at 12-o'clock. Each photograph filename shall be entered into the electronic database in the appropriate record that it is associated with.

3.4 Deliverables:

A. Electronic database with inventory and condition data, along with photographs.

B. A binder with hard copies of the Manhole Inspection Forms including photos shall be submitted to the ENGINEER.

C. All photographs shall be digital pictures in both hard copy and electronic format.

D. Supplemental sketches will be provided, as necessary, to clearly depict the actual site conditions.

3.5 Records: Observations shall be recorded on a Manhole Inspection Form report form. The information recorded shall include location of the manhole, relationship of incoming and outgoing pipes, sizes of pipes, depth and diameter of manhole, condition of cover and frame, type of material

and condition of cone and walls, signs of infiltration/inflow, and any other pertinent information which would effect a manhole rehabilitation decision. The pipes entering and exiting the manhole shall be inspected from the manhole and such conditions as type of pipe material, joint condition, signs of joint leakage, presence of roots, and amount of debris visible in the pipes shall also be recorded on the Manhole Inspection Form.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Manhole Inspection:

A. Measurement: Manhole inspection, of the various depths, will be measured per Each inspection made including manual inspection, 3D internal imaging and GPS, manhole structural assessment, Manhole Inspection Form, etc., including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Each manhole inspected, documented and filed.

B. Payment: Manhole inspection, measured as provided above, will be paid at the Contract unit price per Each for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices.

C. Pay Item:

Manual Manhole Inspection (05240)(01) per Each

3D Manhole Condition Assessment with Internal Images and GPS (05240)(02) per Each

Structural Manhole Condition Assessment with Internal Images (05240)(03) per Each

(See "Manhole Inspection Form" Attached)

- END OF SECTION -

MANHOLE INSPECTION FORM

MANHOLE NO. _____

Date _____ Pump Basin _____ Street Name _____

Nearest Intersection _____

Locator 1 _____ (FT) _____

Locator 2 _____ (FT) _____

Locator 3 _____ (FT) _____

Manhole NOT Street (Location) Description _____

Nearest Street North _____ South _____ East _____ West _____

Buried (yes)(no) Pavement Type _____ Manhole Depth _____ (ft) Manhole I.D. _____ (ft)

Flow Depth _____ (ft) _____ (in) Ponding (yes) (no) Steps (yes) (no)

MANHOLE LEAK INFORMATION			
ITEM	TYPE	CONDITION	LEAK SIZE
Cover			
Ring/Riser			
Cone			
Wall			
Bench/Channel			

MANHOLE INFLUENT INFORMATION			
FLOW	From SMH #	Pipe Dia. (in)	Direction
Out	See Above		
In			
In			
In			

	RECOMMENDATIONS	YES	NO
1	Manhole Infiltration Test		
2	Repair Pipe to Manhole Connections		
3	Repair Bench / Channel		
4	Replace Bench / Channel		
5	Void Repair (Patching)		
6	Infiltration Repair (Plugging)		
7	Infiltration Repair (Grout Injection)		
8	Replace Manhole Chimney		
9	Replace Manhole Cone		
10	Reseal Joints in Pre-Cast Conc. Manhole		
11	Manhole Riser Ring (Concrete)		
12	Manhole Riser Ring (Cast Iron)		
13	Remove and Re-set MH. Frame and Cover		
14	Replace Manhole Frame and Cover		
15	Manhole Street Patch		
16	Reseal Manhole Frame		
17	Permanent Plug for Manhole Pipe Stub		
18	Remove Manhole Steps		

NOTES: _____

_____

-END-

05240

SECTION 05250

MISCELLANEOUS SEWER MANHOLE REPAIRS

PART 1 - GENERAL

1.1 Scope: This Section includes furnishing of all labor, materials, tools and equipment, and perform all operations necessary for sanitary sewer manhole repair as specified herein for the purpose of eliminating infiltration, providing corrosion protection, adjusting final grade of manhole top, repair of voids, replacement of risers, new rings, repair of or new frames and covers, bench repair, void repair, remove steps, and other miscellaneous items as specified herein.

1.2 Inspection: Refer to Section 05240 – Sewer Manhole Inspection.

1.3 Applicable Publications: The publications listed below form a part of this specification to the extent referenced. The publications may be referred to in the text by basic designation only.

American Society for Testing and Materials (ASTM) Publication:

C109	Test Method for Compressive Strength of Hydraulic Cement Mortars
C150	Portland Cement
C293	Test Method for Flexural Strength of Concrete (Using Simple Beam With Center-Point Loading)
C403	Test Method for Time Setting of Concrete Mixtures by Penetration Resistance
C469	Test Method for Static Modules of Elasticity and Poisson's Ratio of Concrete and Compression
C827	Test Method for Early Volume Change of Cementitous Mixture

1.4 Submittals: The following information shall be submitted in accordance with provisions of Section 03340 - Shop Drawings, Samples and Project Data.

PART 2 - PRODUCTS

2.1 Brick Masonry: Refer to Section 05120 - Sanitary Sewer Manholes.

2.2 Manhole Covers and Frames: Refer to Section 05120 - Sanitary Sewer Manholes.

2.3 Riser Rings: Refer to Section 05120 - Sanitary Sewer Manholes.

2.4 Manhole Covers and Frames: Refer to Section 05120 - Sanitary Sewer Manholes.

2.5 Cone Replacement: Refer to Section 05120 - Sanitary Sewer Manholes.

2.6 Non-Shrink Cement Grout: Refer to Section 07330 – Cast-In-Place Concrete.

2.7 Patching Material: A quick setting fiber reinforced calcium aluminate corrosion resistant cementitious material shall be used as a patching material and is to be mixed and applied according to manufacturer's recommendations and shall have the following minimum requirements:

A. Compressive Strength (ASTM C109): 1,400 psi, 6 hrs.

B. Shrinkage (ASTM C596): 0% at 90% relative humidity

C. Minimum Bond (ASTM C321): 145 psi, 28 days

D. Cement: Calcium aluminate cement

E. Density, when applied: 105 ±5pcf

F. Set Time: 15 to 30 minutes

Patching material shall be Strong-Seal QSR or approved equal.

2.8 Plugging Material: A rapid setting, high-early strength, cementitious product specifically formulated for leak control shall be used as a plugging material to stop minor water infiltration. The material shall be mixed and applied according to the manufacturer's recommendations and shall have the following minimum requirements:

A. Compressive Strength (ASTM C109): 400 psi @ 1 hr./1800 psi @ 24 hrs.

B. Expansion (ASTM C827): 0.10%

C. Sulfate Resistance (ASTM C267): No weight loss after 15 cycles @ 2,000 ppm.

D. Freeze/Thaw (ASTM C666, "Method A"): 100 cycles

E. Pull Out Strength (ASTM C234): 14,000 lbs

F. Set Time: 1.0 minute

Plugging material shall be Strong-Plug as manufactured by Strong-Seal, Thoroc Plug as manufactured by ChemRex of Shakopee, MN, or approved equal.

2.9 Injectable Grout: A polyurethane gel shall be used for stopping very active infiltration. The material shall be applied by pressure grouting thru the manhole walls. Injectable grout material shall be Hydro Active Multigel NF as manufactured by Deneef, Strata-Tech, or approved equal.

2.10 Sealant for Manhole Frame and Adjustment Rings: Sealant for seating manhole frames and adjustment rings shall be designed specifically for that purpose. If internal sealing methods are to be used, the product shall be "Flex-Seal Utility Sealant" as manufactured by Sealing Systems, Inc., Spectrashield, or approved equal. If external sealing methods are to be used, the product shall be "SurSeal" as manufactured by Mar Mac Construction Products, Corrosion Protection Systems, or approved equal.

PART 3 - EXECUTION

3.1 General: It shall be the sole responsibility of the CONTRACTOR to insure that manholes to be rehabilitated are structurally secured, properly ventilated, or otherwise safe during all operations of the work.

3.2 Locating Manholes: The CONTRACTOR shall locate each manhole within the Task Order area prior to beginning any sewer manhole repair work. The method of location of sewer manholes may include use of available record drawings, electronic metal location devices, etc. There will be no separate pay for locating manholes.

3.3 Inspection: Refer to Section 05240 – Sewer Manhole Inspection.

3.4 Manhole Inspection Report: Refer to Section 05240 – Sewer Manhole Inspection.

3.5 Gravity Sanitary Sewer Flow Control: Plugging or blocking and pumping and bypassing of the sewer flow around manholes designated for rehabilitation shall be in accordance with Section 05230 - Gravity Sewer By-Pass Pumping.

3.6 Plugging and Blocking: Pipe into and out of manhole shall be temporarily plugged or blocked as necessary to keep flows out during repairs and to prevent extraneous construction/repair materials from entering sewer mains and services. Plugs shall be removed following completion of work.

3.7 Cleaning: CONTRACTOR shall clean all manholes to be rehabilitated.

A. All internal debris, foreign matter, trash, earth, gravel, grease and other accumulated debris and laitance shall be removed from the manhole. All debris resulting from the cleaning process shall be removed immediately after the cleaning process and the manhole shall be allowed to dry. Contractor shall dispose of debris in an approved manner. In no case shall the application of coating material begin any later than 48 hours after the manhole has dried.

B. Foreign material shall be removed from surfaces to be repaired by means of high pressure water spray (minimum 2500 psi) using potable water. Sand blasting shall also be employed if deemed necessary to achieve a totally clean surface. No other method shall be used without the consent of the Engineer.

C. Cleaning agents such as muriatic acid or detergent may be used with high pressure spray. If muriatic acid or detergent is employed, then surfaces shall be thoroughly rinsed with potable water afterwards, applying at least three (3) complete rinses to the surfaces to be repaired.

D. Steam cleaning, detergent scrubbing or the use of a degreaser is recommended for removing films and deposits of grease and oil.

E. Following the last rinse and prior to any patching or other repairs, a pH test of the rinse water on the surface shall be performed in accordance with ASTM D4262 and as follows:

a. A strip of litmus test paper shall be dipped in the rinse water remaining on the surface. After the paper changes color it will compared to an appropriate color chart and matched to determine the PH. Such sampling for pH shall be performed randomly, two (2) per every five (5) vertical-feet and at areas that are difficult to properly flush and rinse. The pH of the fresh rinse water at is source outlet shall also be determined.

b. If the pH of the rinse water on the manhole surface is more than 2.0 pH higher or more than 1.0 pH lower than the fresh rinse water, then the surface shall be further neutralized with fresh water and retested until the pH is within the acceptable range.

3.8 Manhole Infiltration Test:

A. If the nature or location of manhole defects are not readily apparent, the CONTRACTOR may be directed to perform water testing. The CONTRACTOR shall obtain the ENGINEER'S consent prior to performing any water testing.

B. Testing shall be accomplished by flooding the ground surface around the designated manhole with dyed water to simulate a stormwater runoff condition and to verify location of repairs to be done.

C. If necessary to concentrate the test water at the manhole and/or increase head pressure on suspected manhole defects, the CONTRACTOR shall make an excavated basin and/or raised berm around the manhole, with the formed cavity to be filled with dyed water. CONTRACTOR may be directed to auger holes into the ground in the basin around the manhole, to facilitate dyed water reaching manhole defects.

D. Dye shall be fluorescent-colored, non-toxic, non-hazardous, non-staining and approved for use in this application.

3.9 Remove Damaged Substrate:

A. Loose and protruding brick, mortar, concrete and/or aggregate shall be completely removed using a mason's hammer and chisel and/or scraper. All cracks, runs and holes shall be completely chipped to a firm surface. All cracked and irregular bricks shall be

replaced. Corrosion-damaged surfaces shall be removed down to an uncontaminated surface.

B. For pre-cast concrete manholes, at any area where the concrete substrate has deteriorated to the point of revealing the underlying reinforcement steel, a uniform environment shall be created around the full circumference of the steel bar. This shall be accomplished by:

1. Undercutting and removing unsound and sound concrete in contact with the steel.

2. Removing, by appropriate means, all corrosion from the surfaces of the steel.

3. Thoroughly cleaning the cavity with sand blast and/or clean high-pressure water spray per the methods described in this Section.

3.10 Pipe to Manhole Connection: When required due to failing, leaking, loose connection, deteriorated or broken components, etc. and/or when directed by the ENGINEER, the sewer main line connection(s) to a manhole shall be reconstructed. This will include grouted waterstop, non-shrink cement grout, etc. The CONTRACTOR shall carefully resize/breakout the existing connection point. The wall breakout will be of sufficient size to accommodate the new pipe and grouted waterstop. The connection shall be completely sealed with nonshrink cement grout. Installation shall be in conformance with Section 05510 - Gravity Sanitary Sewers System and Related Appurtenances. This work shall be performed prior to manhole sidewall rehabilitation. This work shall be performed to the satisfaction of the ENGINEER.

3.11 Repair Manhole Bench/Channel: In cases where defects exist in the bench and/or channel, but deterioration is insufficient to justify a complete replacement of the bench/channel, repairs shall be made using non-shrink cement grout. Invert channel shall be repaired where there is visible damage or where infiltration is present. After flow through manhole is blocked and bench and channels are thoroughly cleaned, the CONTRACTOR shall make the repairs in an expeditious manner. Infiltration repairs shall be made using quick-setting plugging mix or pressure grout as described in Paragraph 3.15. Irregularities in surface of bench and channel shall be filled, smoothed and sealed with non-shrink grout. The material shall be trowelled uniformly onto damaged areas a minimum thickness of ½" at the invert and extending out onto the bench. The finished invert surfaces shall be smooth and free of ridges. The bench/channel shall provide a smooth transition between pipe inverts and between the wall and the edge of the flow channel. Flow may be re-established in the manhole after a time interval recommended by the grout manufacturer.

3.12 Replace Manhole Bench/Channel: In cases where the bench and/or channel are severely damaged or otherwise deteriorated beyond repair, the CONTRACTOR shall break out existing bench and/or channel if exists, as much as possible, and replace it using non-shrink grout and/or other approved products. Reform all inverts and pipe channels to allow for smooth hydraulic performance. The bench/channel shall provide a smooth transition between pipe inverts and between the wall and the edge of the flow channel. Flow may be re-established in the manhole after a time interval recommended by the grout manufacturer.

3.13 Manhole Void Repair (Patching): Where directed by the ENGINEER, the CONTRACTOR shall fill crevices, gaps, cracks, cavities, depressions, voids and other surface irregularities with quick-setting patching mix. Area to be patched, shall be cleaned and prepared by chipping any loose material and removing any debris from the void. All surrounding surfaces shall be properly cleaned before the application of the patching material. CONTRACTOR shall apply patching material to void areas by hand or trowel. Patching mix shall be used according to manufacturer's recommendations. Patching mix shall be worked and troweled smooth to meet and match curvature of adjoining surfaces.

3.14 Manhole Infiltration Repair (Plugging): Minor active leaks shall be stopped with specifically formulated quick-setting plugging mix. Plugging mix shall be used according to manufacturer's recommendations. Weep holes may be drilled as necessary to localize infiltration during application of the quick-setting mix. After application, weep holes shall be plugged with quick-setting mix.

3.15 Manhole Infiltration Repair (Grout Injection): Major active leaks, not repaired by plugging, shall be stopped by grout injection. Grout injection shall not be used in manholes where the leakage is unconfinable such as in brick manholes or where the structural integrity of the manhole has been lost. Grout shall be used according to manufacturer's recommendations. All grout injection shall be conducted during high groundwater conditions, unless the points of leakage have been previously identified.

A. The basic equipment shall consist of all necessary equipment including chemical pumps, chemical containers, injection packers, hoses, valves, and pressure meters that will provide for monitoring pressure during the injection of the grout. When necessary, fluid bypass lines equipped with pressure-regulated bypass valves will be incorporated into the pumping system.

B. A hole shall be carefully drilled at each point of leakage within the manhole structure from within the manhole and shall extend through the entire manhole wall. In cases where multiple leaks occur around the circumference of the manhole, it may not be necessary to drill a hole at each location, providing all leakage is stopped from these holes. Injection devices (packers) shall be placed into the previously drilled holes in such a way that they will provide a watertight seal between the holes and the injection device. The injection device shall be attached to an injection pump with hose(s). Injectable grout shall then be pumped through the hose until material refusal is recorded on the pressure gage mounted on the pumping unit or a predetermined quantity of grout has been injected. Care shall be taken during the pumping operation to insure that excessive pressures do not develop and cause damage to the manhole structure. Upon completion of the injection, the packers shall be removed and the remaining holes filled with rapid strength cement grout and troweled flush with the surface of the manhole walls or other surfaces.

C. After the grout injection operation has been completed, the manhole shall be visually inspected for the elimination of excessive infiltration by the CONTRACTOR and ENGINEER's Representative.

3.16 Replace Manhole Chimney:

A. Where directed by ENGINEER, CONTRACTOR shall remove deteriorated chimney and install new chimney.

B. This item of work shall include but not be limited to: excavation to completely expose existing chimney; removal of frame and adjustment rings; removal and disposal of existing chimney materials; installation of new chimney; furnishing new adjustment rings as necessary; reseating of frame and adjustment rings; grouting exterior of the installation; native backfill as required. Replacement of surrounding pavement will be considered a separate item of work.

3.17 Replace Manhole Cone:

A. Where directed by ENGINEER, CONTRACTOR shall remove deteriorated cone and install new precast concrete cone section. A preformed gasket material shall be placed in all keyways between existing manhole riser section and cone joints.

B. This item of work shall include but not be limited to: excavation to completely expose cone; removal of frame and adjustment rings; removal and disposal of existing cone materials; installation of new cone, furnishing new adjustment rings as necessary; reseating of frame and adjustment rings; grouting the exterior of the installation; native backfill. Replacement of surrounding pavement will be considered a separate item of work.

3.18 Reseal Joints in Precast Concrete Manhole:

A. Where directed by ENGINEER, CONTRACTOR shall completely reseal designated joints in precast concrete manholes. Such joints may be between chimney and cone sections, cone and wall sections, or two wall sections.

B. Existing sealing material shall be removed and joint surfaces shall be cleaned with high pressure water spray or sand blast. Joint shall be resealed with non-shrink grout or other approved sealant.

C. If, in the opinion of the ENGINEER, surface application of sealant is inadequate to stop infiltration conditions, then pressure grouting shall be employed using an approved cementitious or chemical grout. Manufacturer's recommendations shall be followed when pressure grouting is installed.

3.19 Riser Rings: Where directed by ENGINEER, the CONTRACTOR shall replace existing deteriorated riser rings with new precast concrete riser rings and/or cast iron riser rings. All manholes to receive casting adjustment and/or alignment shall be adjusted to meet existing finished grade unless an alternative elevation is required. A grout material shall be placed in between individual precast concrete riser rings, and precast concrete riser ring and cone joints. An epoxy system designed for metal-to-metal adhesion shall be used to connect individual cast iron riser rings and the cast iron riser rings to the frame.

3.20 Remove and Reset Manhole Frame and Cover: When directed by ENGINEER, existing frames and covers which must be removed to facilitate manhole rehabilitation, riser reconstruction,

and/or casting alignment or grade adjustments shall be salvaged, cleaned and reset, unless determined to be defective by the ENGINEER. The work shall be in accordance with Section 05120 - Sanitary Sewer Manholes of the Specifications. Manholes adjusted in yards or nonpaved areas shall be brought to within 0.10 feet above the surrounding area.

3.21 Replace Manhole Frame and Cover: Where directed by ENGINEER, the CONTRACTOR shall replace existing deteriorated frames and covers with new frames and covers. This item of work shall include but not be limited to: excavation to expose frame-to-cone/chimney connection; removal and disposal of existing frame and cover; seating of replacement frame and cover with approved sealant grouting the exterior of the installation, and native backfill as necessary. The work shall be in accordance with Section 05120 - Sanitary Sewer Manholes of the Specifications. Manholes adjusted in yards or nonpaved areas shall be brought to within 0.10 feet above the surrounding area.

3.22 Manhole Street Patch: Refer to Section 07240 – Street Pavement Replacement and Patching and related sub-sections.

3.23 Reseal Manhole Frame: Where directed by ENGINEER, the CONTRACTOR shall remove the frame and reseal it to the cone or chimney top. This item of work shall include but not be limited to: excavation to expose frame-to-cone/chimney connection; removal of frame; seating of frame and rings with approved sealant; grouting the exterior of the installation; native backfilling. The work shall be in accordance with Section 05120 - Sanitary Sewer Manholes.

3.24 Permanent Plug for Manhole Pipe Stub: CONTRACTOR shall install a permanent plug in existing pipe stubs designated to be abandoned. Plug shall consist of non-shrink grout or other approved sealant. Sealant shall completely fill the pipe and form a plug not less than twelve (12) inches long. Sealant shall be trowelled smooth.

3.25 Remove Manhole Steps: CONTRACTOR shall remove steps from designated manholes by means of chipping out the surrounding area so that the steps can be either pulled out completely or cut off so that stubs are inset at least two (2) inches in the wall. Resulting holes shall be sealed with non-shrink grout or other approved sealant.

3.26 Inspection: The ENGINEER shall make a visual inspection of the completed work. Any leaks shall be chipped back and the area plugged and resealed in accordance with these Specifications. Any deficiencies in the work shall be identified and repaired prior to application of the manhole lining system.

3.27 Recording: Each rehabilitation regardless of type shall be recorded in conformance with Paragraph 3.4 of this section.

3.28 Testing: The ENGINEER may have tests made on such things as the degree of compaction of backfill, the compressive strength of concrete or other work. This will be done at no cost to the CONTRACTOR. If the requirements of the Specifications are not met, the CONTRACTOR shall take all necessary remedial action at his own expense and the costs of re-testing shall be borne by the CONTRACTOR.

3.29 Backfilling and Compaction: Refer to Section 07150 - Excavation, Backfill and Compaction of Utility Trenches.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Cleaning of Manholes:

A. Measurement: Cleaning of Manholes, satisfactorily completed and accepted as Specified or as Directed shall be measured by the number of manholes that are cleaned and cleared of accumulated debris .

B. Payment: Cleaning of Manholes, completed as provided above will be paid at the Contract unit price per each, which price and payment shall constitute full compensation for furnishing all materials, equipment, tools, labor, hauling, traffic control, signs, barricades, safety items and incidentals necessary to complete this item in accord with Specifications.

C. Pay Items: Cleaning of Manholes (05250)(01) per Each.

4.2 Manhole Infiltration Test:

A. Measurement: Manhole Infiltration Test, satisfactorily completed and accepted as Specified, or as Directed, shall be measured by the number of external dye tests approved by the ENGINEER and performed by the CONTRACTOR in accordance with these Specifications.

B. Payment: Manhole Infiltration Test, placed, tested and accepted, measured as provided above will be paid at the Contract unit price per each, which price and payment shall constitute full compensation for furnishing all materials, equipment, tools, labor, hauling, traffic control, signs, barricades, safety items and incidentals necessary to complete this item in accord with the Specifications.

C. Pay Items: Manhole Infiltration Test (05250)(02) per Each.

4.3 Repair Pipe to Manhole Connections:

A. Measurement: Repair Pipe to Manhole Connections, satisfactorily completed and accepted as Specified, or as Directed, shall be measured by the number of completed and accepted connections, in accordance with these Specifications.

B. Payment: Repair Pipe to Manhole Connections, completed as provided above will be paid at the Contract unit price per each, which price and payment shall constitute full compensation for furnishing all materials, equipment, tools, labor, excavation and native backfill, hauling, traffic control, signs, barricades, safety items and incidentals necessary to complete this item in accord with the Specifications.

C. Pay Items: Repair Pipe to Manhole Connections ("Select Material" paid Elsewhere) (05250)(03) per Each.

4.4 Repair Manhole Bench/Channel:

A. Measurement: Repair Manhole Bench/Channel, satisfactorily completed and accepted as Specified, or as Directed, shall be measured by the number of manholes that receive repairs to bench and/or channel in accordance with these Specifications.

B. Payment: Repair Manhole Bench/Channel, completed as provided above will be paid at the Contract unit price per each, which price and payment shall constitute full compensation for furnishing all materials, equipment, tools, labor, hauling, traffic control, signs, barricades, safety items and incidentals necessary to complete this item in accord with the Specifications.

C. Pay Items: Repair Manhole Bench/Channel (05250)(04) per Each.

4.5 Replace Manhole Bench/Channel:

A. Measurement: Replace Manhole Bench/Channel, satisfactorily completed and accepted as Specified, or as Directed, shall be measured by the number of manholes that the bench and/or channel have been removed and replaced in accordance with these Specifications.

B. Payment: Replace Manhole Bench/Channel, completed as provided above will be paid at the Contract unit price per each, which price and payment shall constitute full compensation for furnishing all materials, equipment, tools, labor, hauling, traffic control, signs, barricades, safety items and incidentals necessary to complete this item in accord with the Specifications.

C. Pay Items: Replace Manhole Bench/Channel (05250)(05) per Each.

4.6 Manhole Void Repair (Patching):

A. Measurement: Manhole Void Repair (Patching), satisfactorily completed and accepted as Specified, or as Directed, shall be measured by the cubic foot of patching material used to make repairs in accordance with these Specifications. Volume shall be computed using the manufacturer's printed yield data.

B. Payment: Manhole Void Repair (Patching), completed as provided above, will be paid at the Contract unit price per cubic foot , which price and payment shall constitute full compensation for furnishing all materials, equipment, tools, labor, hauling, traffic control, signs, barricades, safety items and incidentals necessary to complete this item in accord with the Specifications.

C. Pay Items: Manhole Void Repair (Patching) (05250)(06) per Cubic Foot.

4.7 Manhole Infiltration Repair (Plugging)

A. Measurement: Manhole Infiltration Repair (Plugging), satisfactorily completed and accepted as Specified, or as Directed, shall be measured by the cubic foot of plugging

material used to make repairs in accordance with these Specifications. Volume shall be computed using the manufacturer's printed yield data.

B. Payment: Manhole Infiltration Repair (Plugging), completed as provided above, will be paid at the Contract unit price per cubic foot, which price and payment shall constitute full compensation for furnishing all materials, equipment, tools, labor, hauling, traffic control, signs, barricades, safety items and incidentals necessary to complete this item in accord with the Specifications.

C. Pay Items: Manhole Infiltration Repair (Plugging) (05250)(07) per Cubic Foot.

4.8 Manhole Infiltration Repair (Grout Injection)

A. Measurement: Manhole Infiltration Repair (Grout Injection), satisfactorily completed and accepted as Specified, or as Directed, shall be measured by the gallon of grout material used to make repairs in accordance with these Specifications. Volume shall be computed by counting the number of containers of known volume, or portions thereof, actually incorporated into the work.

B. Payment: Manhole Infiltration Repair (Grout Injection), completed as provided above, will be paid at the Contract unit price per gallon, which price and payment shall constitute full compensation for furnishing all materials, equipment, tools, labor, hauling, traffic control, signs, barricades, safety items and incidentals necessary to complete this item in accord with the Specifications.

C. Pay Items: Manhole Infiltration Repair (Grout Injection) (05250)(08) per Gallon.

4.9 Replace Manhole Chimney:

A. Measurement: Replace Manhole Chimney, satisfactorily completed and accepted as Specified, or as Directed, shall be measured by the vertical foot based on manhole diameter of chimney removed and replaced in accordance with these Specifications. Measurement shall be made from the top of foundation to bottom of cone.

B. Payment: Replace Manhole Chimney, completed as provided above will be paid at the Contract unit price per each, which price and payment shall constitute full compensation for furnishing all materials, equipment, tools, labor, excavation and native backfill, hauling, traffic control, signs, barricades, safety items and incidentals necessary to complete this item in accord with the Specifications.

C. Pay Items: Replace Manhole Chimney ("Select Material" paid Elsewhere) (05250)(09) per Each.

4.10 Replace Manhole Cone:

A. Measurement: Replace Manhole Cone, satisfactorily completed and accepted as Specified, or as Directed, shall be measured by the number of manholes that the cone has been removed and replaced in accordance with these Specifications.

B. Payment: Replace Manhole Cone, completed as provided above will be paid at the Contract unit price per each, which price and payment shall constitute full compensation for furnishing all materials, equipment, tools, labor, excavation and native backfill, hauling, traffic control, signs, barricades, safety items and incidentals necessary to complete this item in accord with the Specifications.

C. Pay Items: Replace Manhole Cone ("Select Material" paid Elsewhere) (05250)(10) per Each.

4.11 Reseal Joints in Precast Concrete Manhole:

A. Measurement: Reseal Joints in Precast Concrete Manhole, satisfactorily completed and accepted as Specified, or as Directed, shall be measured by the linear foot of joints that have been resealed in accordance with these Specifications.

B. Payment: Reseal Joints in Precast Concrete Manhole, completed as provided above, will be paid at the Contract unit price per linear foot, which price and payment shall constitute full compensation for furnishing all materials, equipment, tools, labor, hauling, traffic control, signs, barricades, safety items and incidentals necessary to complete this item in accord with the Specifications.

C. Pay Items: Reseal Joints in Precast Concrete Manhole (05250)(11) per Linear Foot.

4.12 Manhole Riser Ring (Concrete):

A. Measurement: Precast Concrete Manhole Riser Rings, satisfactorily completed and accepted as Specified, or as Directed, shall be measured per each for the various sizes that have been installed in accordance with these Specifications.

B. Payment: Precast Concrete Manhole Riser Rings, completed as provided above, will be paid at the Contract unit price per each, which price and payment shall constitute full compensation for furnishing all materials, equipment, tools, labor, excavation and native backfill, hauling, traffic control, signs, barricades, safety items and incidentals necessary to complete this item in accord with the Specifications.

C. Pay Items:

4" Precast Concrete Manhole Riser Rings ("Select Material" paid Elsewhere) (05250)(12) per Each.

6" Precast Concrete Manhole Riser Rings ("Select Material" paid Elsewhere) (05250)(13) per Each.

4.13 Manhole Riser Ring (Cast Iron):

A. Measurement: Cast Iron Manhole Riser Rings, satisfactorily completed and accepted as Specified, or as Directed, shall be measured by the vertical inch that have been installed in accordance with these Specifications.

B. Payment: Cast Iron Manhole Riser Rings, completed as provided above, will be paid at the Contract unit price per vertical inch, which price and payment shall constitute full compensation for furnishing all materials, equipment, tools, labor, excavation and native backfill, hauling, traffic control, signs, barricades, safety items and incidentals necessary to complete this item in accord with the Specifications.

C. Pay Items:

1 ½" Cast Iron Manhole Riser Rings (05250)(14) per Each.

2" Cast Iron Manhole Riser Rings (05250)(15) per Each.

3" Cast Iron Manhole Riser Rings (05250)(16) per Each.

4.14 Remove and Reset Existing Manhole Frame and Cover:

A. Measurement: Remove and Reset Existing Manhole Frame and Cover, satisfactorily completed and accepted as Specified, or as Directed, shall be measured by the number of manholes that the frame and cover has been removed and reset with the existing frame and cover in accordance with these Specifications.

B. Payment: Remove and Reset Existing Manhole Frame and Cover, completed as provided above will be paid at the Contract unit price per each, which price and payment shall constitute full compensation for furnishing all materials, equipment, tools, labor, excavation and native backfill, hauling, traffic control, signs, barricades, safety items and incidentals necessary to complete this item in accord with the Specifications.

C. Pay Items: Remove and Reset Existing Manhole Frame and Cover (05250)(17) per Each.

4.15 Replace Existing Manhole Frame and Cover:

A. Measurement: Replace Existing Manhole Frame and Cover, satisfactorily completed and accepted as Specified, or as Directed, shall be measured by the number of manholes that the frame has been replaced with a new frame and cover in accordance with these Specifications.

B. Payment: Replace Existing Manhole Frame and Cover, completed as provided above will be paid at the Contract unit price per each, which price and payment shall constitute full compensation for furnishing all materials, equipment, tools, labor, hauling, traffic control, signs, barricades, safety items and incidentals necessary to complete this item in accord with the Specifications.

D. Pay Items: Replace Existing Manhole Frame and Cover (05350)(18) per Each.

4.16 Reseal Manhole Frame:

A. Measurement: Reseal Manhole Frame, satisfactorily completed and accepted as Specified, or as Directed, shall be measured by the number of manholes that the frame has been resealed in accordance with these Specifications.

B. Payment: Reseal Manhole Frame, completed as provided above will be paid at the Contract unit price per each , which price and payment shall constitute full compensation for furnishing all materials, equipment, tools, labor, hauling, traffic control, signs, barricades, safety items and incidentals necessary to complete this item in accord with the Specifications.

C. Pay Items: Reseal Manhole Frame (05250)(19) per Each.

4.17 Permanent Plug for Manhole Pipe Stub:

A. Measurement: Permanent Plug for Manhole Pipe Stub, satisfactorily completed and accepted as Specified, or as Directed, shall be measured by the number of pipe stubs that have been permanently plugged, in accordance with these Specifications.

B. Payment: Permanent Plug for Manhole Pipe Stub, completed as provided above will be paid at the Contract unit price per each , which price and payment shall constitute full compensation for furnishing all materials, equipment, tools, labor, hauling, traffic control, signs, barricades, safety items and incidentals necessary to complete this item in accord with the Specifications.

C. Pay Items: Permanent Plug for Manhole Pipe Stub (05250)(20) per Each.

4.19 Remove Manhole Steps:

A. Measurement: Remove Manhole Steps, satisfactorily completed and accepted as Specified, or as Directed, shall be measured by the number of manholes from which steps have been removed, regardless of the number of steps in each manhole, in accordance with these Specifications.

B. Payment: Remove Manhole Steps, completed as provided above, will be paid at the Contract unit price per each manhole, which price and payment shall constitute full compensation for furnishing all materials, equipment, tools, labor, hauling, traffic control, signs, barricades, safety items and incidentals necessary to complete this item in accord with the Specifications.

E. Pay Items: Remove Manhole Steps (Per Manhole) (05250)(21) per Each.

4.20 Un-Cover Buried Sewer Manhole:

A. Measurement: Un-covering sewer manholes and SMH Entry Cutting of C.I.P.P. service entries, of the depths noted, including excavation, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Each.

B. Payment: Un-covering sewer manholes and cutting of SMH C.I.P.P. at service connection, measured as provided above, will be paid at the Contract unit price per Each for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere)(Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere)(Pavement Repair or Replacement Paid Elsewhere)(Traffic Control Paid Elsewhere).

C. Pay Item:

Un-Cover Buried Sewer Manholes Less than 12" Deep (05250)(22) per Each

Un-Cover Buried Sewer Manholes Greater than 12" Deep and Less than 24" Deep (05250)(23) per Each

SMH Entry Cutting of Cured-In-Place at Service Connection (05250)(24) per Each

- END OF SECTION -

SECTION 05260

SEWER MANHOLE, WET PIT AND OTHER STRUCTURES - INTERIOR RECONSTRUCTION AND COATING SYSTEMS

PART 1 - GENERAL

1.1 Scope: This Section includes the requirements for manhole lining, reconstruction, coatings and other miscellaneous related appurtenances including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and/or directed by the ENGINEER and including but not limited to:

A. Internal Concrete Forming System with PVC Liner.

B. Corrosive Resistant Monolithically Applied Coating.

C. Cement Liner and Cement Liner with Epoxy Cell.

D. Protective Epoxy Coating.

E. Manhole Frame and Cover Internal Waterstop.

1.2 Submittals: Submit product data in conformance with Section 03340 - Shop Drawings, Samples and Project Data.

1.3 Experience: CONTRACTOR shall provide certified and current written proof from all product manufacturers or other owners defining the proper and successful use of a minimum of 500,000 square feet of each product.

1.4 Certification: CONTRACTOR shall provide product manufacturers certification stating that the CONTRACTOR is a current qualified installer of each product.

1.5 Warranty: All products herein and the performance thereof shall be warranted for ten (10) years for installation, defects and performance. Warranties shall begin on the date of the Task Order Closeout.

PART 2 - PRODUCTS

2.1 Internal Concrete Forming System: Internal concrete forming system shall be PERMAFORM or approved equal.

A: Concrete: The concrete shall be Type I/II Portland cement concrete with 5/8 inch minus coarse aggregate with fiber reinforcement and plasticizers producing an average compressive strength of 4,000 psi at full cure. (Other formulations and filler materials may be selected to meet specific needs).

B. Plastic Liner: When corrosive elements are present, a ribbed or studded plastic liner shall be anchored into the new interior wall during the procedure to create an impermeable barrier. The plastic liner shall be Ameron T-Lock or prior approved equal as best suited for the corrosion condition and compatibility with the pipe liner.

2.2 Corrosive Resistant Monolithically Applied Coated: The coating system shall be a spray-applied 100% solids epoxy monolithic surfacing system for use in coating new or existing manholes, wetwells, liftstations, treatment plants, and other structures. All products to be used on this project must be pre-approved by the ENGINEER prior to the bid date.

A. Minimum Characteristics:

1. Minimum Compressive Strength 12,000 psi

2. Minimum Tensile Strength 7,000 psi

3. Minimum Flexural Strength 11,000 psi

4. Minimum Bond Strength 500 psi

5. Minimum corrosion resistance suitable for environments pH of 0.5 or higher.

B. The corrosive resilient monolithically applied coating system shall be "Warren Environmental System" by Warren Environmental or approved equal.

2.3 Cement Liner: Cement liner shall be CMS-10K DENJER CEMENT or approved equal. The cement liner with epoxy gell shall be CMS-10K DENGER CEMENT with S.G. Mastic or approved equal. CMS-10K without the S.G. Mastic is not approved for corrosive environment.

SILICA FUME BASED MORTAR

		1 day	7 days	28 days
ASTM C-109	Compressive Strength	4000	8000	11000
ASTM C-78	Flexural Strength	800	915	1050
ASTM C-882	Slant Shear	1400	3000	
ASTM C-496	Splitting Tensile	602	958	1156
ASTM	Set Time	Intial: 60 min. Final: 180 min.		
ASTM C-267	Chemical Resistance (sulfide solution)	No Weight Loss		56 days
AASHTO T-277	Permeability	300 Coulombs		

2.4 Protective Epoxy Coating: Two component solvent free epoxy system, 100% solids shall be "SG-Mastic" by DENJER or approved equal.

A. Physical Properties:

1. Mix Ratio: Pre-proportioned units

2. Color/Mixed: Gray

3. Pot Life: 200 grams; 40 min. & 25°C

4. Generic Type: Amine-cured epoxy

5. Solids By Volume: 100%

6. VOC: O lbs/gal.

7. Viscosity @ 25°C: 225,000 cps

8. Coverage per GAL: 16 sq ft/gal @ 100 mils

9. Number of Coats: 1 coats recommended

1. Thickness/Coat: 65 Mils minimum

11. Flash Point: 450°F

12. Compressive Strength: (ASTM D-695)

    a. 8 Hour: 6,800 PSI
    b. 1 Day: 9,900 PSI
    c. 7 Day: 11,200 PSI

13. Tensile Properties: (ASTM D-638)

    a. Tensile Strength: 4,600 PSI
    b. Elongation at Break D-368
    c. Modulus of Elasticity: 7.5 X 105 PSI

2.5 Manhole Frame and Cover Waterstop: Waterstop shall be stainless steel, gasketed, relief valve type and shall be "Rainstopper" with stainless steel handle and stainless steel tetherlock or approved equal. The tetherlock shall be 3/16" braided S.S. and shall be five (5') feet long.

PART 3 - EXECUTION

3.1 Safety: Products herein are dangerous. CONTRACTOR's shall comply with OSHA (29 CFR 1910); 1910.124 Hazardous Materials and 1910.146 General Environmental Control.

3.2 Experience: Refer to paragraph 1.3 herein.

3.3 Certification: Refer to paragraph 1.4 herein.

3.4 General: All products, materials, set-up and installation shall be in strict conformance with the manufactures specification, procedures and guidelines.

3.5 Internal Concrete Forming System:

A. Preparation: The CONTRACTOR shall employ adequate cleaning to remove loose material and debris from the manhole. Existing steps which might interfere with the erection of the forms shall be removed. Precautions shall be taken to prevent foreign material from entering the active lines. Infiltration which may adversely affect placement of the concrete shall be eliminated or reduced to an acceptable level.

B. Equipment: Segmented, stackable steel forms shall be bolted together in cylindrical and conical sections with either eccentric or concentric cones or flat top ceilings and conform generally to the interior slope of the existing manhole.

C. Installation Procedure:

2. Pipe extensions shall be placed through the new concrete wall at the base and at higher points of entry, such as drop inlets, to maintain flows during the procedure.

3. The form shall be sized and erected to conform to the existing interior dimensions and shape. The space between the forms and the existing wall shall be of a sufficient thickness, usually 3 inches and no less than 1½ inches. The finished opening shall have a minimum diameter of 20 inches.

4. The form shall be positioned, sealed and finished at the manhole base to ensure concrete does not enter the sewer.

5. The concrete shall be carefully placed from the bottom up in such a manner as to prevent segregation of the cement and aggregate. The concrete shall be consolidated to fill all pockets, seams and cracks within the existing wall.

6. When the concrete has sufficiently cured to preclude slump or damage, the form shall be disassembled and removed.

7. The plastic liner shall be fitted securely to the exterior of the steel forms during their erection within the manhole. When the forms are removed, any joints in the liner shall be welded and tested.

8. The bench shall be reconstructed or repaired in conformance with Section 03520 – Miscellaneous Sewer Manhole Repairs.

9. At the frame and cover, the plastic lining shally be folded under the cast iron frame and reset with butyl mastic.

10. Sealing at all pipe penetration shall be accomplished using one of the following procedures:

a. If the penetrating pipe is PVC and the liner is PVC or if the penetrating pipe is PE and the liner is PE, a fusion or extrude weld

shall be made at their jointure with the new plastic lined wall.

b. If the penetrating pipe is clay (VCP), cast iron, ductile iron or other material, a flat square section of the plastic liner approximately 1.5 times the pipe diameter shall be fitted over the penetrating pipe and fastened with a stainless steel hose clamp. Then it shall be folded back over the hose clamp and flush with the plastic liner embedded into the wall. A weld strip or an extrude bead shall be welded along each edge of this flashing.

D. Finish: The resultant concrete interior wall shall be smooth and free of honeycomb and areas of segregated aggregate.

E. Cleanup: Upon completion, the Contractor shall clean up the work site and properly dispose of any excess material or debris.

3.6 Corrosive Resistant Monolithically Applied Coating:

A. Quality Assurance:

1. CONTRACTOR shall initiate and enforce quality control procedures consistent with applicable ASTM standards.

2. CONTRACTOR shall use an adequate number of skilled workmen who are thoroughly trained and experienced in the necessary crafts. These workmen shall be completely familiar with the specified requirements and the methods needed for property performance of the work of this Section.

3. CONTRACTOR shall use approved specialty equipment adequate in size, capacity and number sufficient to accomplish the work of this Section in a timely manner.

B. Safety:

1. CONTRACTOR shall perform his work in a manner to protect the health and safety of all workmen and the public.

2. All work shall be in accordance with standard industry safety practices.

3. All work, including entry into confined spaces shall be performed in strict compliance with current OSHA regulations.

C. Pre-Coat Inspection:

1. The CONTRACTOR'S vehicles and equipment must be able to access the structures to be coated under their own power.

2. Active flows shall be damned, plugged or diverted as required to ensure that the liquid flow is maintained below the surfaces to be coated.

3. Installation of the protective coating shall not commence on any surfaces containing freshly poured concrete until the concrete substrate has properly cured, and in no case less than 28 days.

D. Surface Preparation:

1. CONTRACTOR shall inspect all surfaces specified to receive the monolithic surfacing system prior to surface preparation. CONTRACTOR shall promptly notify ENGINEER of any noticeable disparity in the surfaces that may interfere with the proper preparation or application of the monolithic surfacing system.

2. All concrete that is not sound or has been damaged by chemical exposure shall be restored to a sound concrete surface. All contaminants including all oils, grease, incompatible existing coatings, waxes, form release, curing compounds, efflorescence, sealers, salts, or other contaminants shall be removed.

3. Surfaces to receive protective coating shall be cleaned to produce a sound concrete or masonry surface with adequate profile and porosity to provide a strong bond between the monolithic surfacing system and the substrate. Surface preparation methods shall be based upon the conditions of the substrate and the requirements of the monolithic surfacing system to be applied, but as a minimum, shall be in accordance with the procedures listed below.

a. Clean all surfaces with high pressure water to remove all loose or contaminated debris. Other equipment and methods may be required to remove all unsound material.
b. When all loose, contaminated, and unsound debris has been removed, the surface shall be etched with a solution of 20% muriatic acid to clean and open the pores of the substrate.
c. The surface shall be washed again and the wash water shall contain a dilute solution of chlorine to diminish microbiological bacteria growth and to kill any bacteria residing on the surface.
d. The surface shall be tested with litmus paper at various points throughout the structure to ensure that the pH is within acceptable limits (not to exceed 8.5). If the surface does not meet the pH requirements, the above steps shall be repeated until the surface pH is within acceptable limits. All tests results will be retained for review by the ENGINEER.
e. Active water infiltration shall be stopped by using a cementitious water plug that is compatible and suitable for top coating with the specified monolithic surfacing system.
f. If pre-installation inspection reveals infiltration (defined as visible and consistent movement of water) though the wall of the structure, a collapse in an area of the wall, a bench that needs to be rebuilt/repaired, a necessity for sandblasting (if necessary after surface preparation as described in specification) or anything that will require more than typical preparation of the structure, the

CONTRACTOR will advise the ENGINEER. Such extra work will be approved in writing between the ENGINEER and the CONTRACTOR prior to the commencement of the work and shall be considered as a separate pay item.

4. Application:

a. The interior surfacing system shall be continuously bonded to all brick, mortar, concrete, chemical sealant, grout, pipe and other surfaces inside the manhole according to ASTM C882 testing and therefore shall be designed for hydrostatic loading.

b. The cured surfacing shall be monolithic with proper sealing connections to all un-surfaced areas and shall be placed and cured in conformance with the recommendations of the monolithic surfacing system manufacturer.

c. When cured, the system shall form a continuous, tight-fitting, hard, impermeable surfacing that is suitable for sewer system service and chemically resistant to any chemicals, bacteria or vapors normally found in domestic sewage.

d. The system shall effectively seal the interior surfaces of the manhole and prevent any penetration or leakage of groundwater infiltration.

e. The system shall be compatible with the thermal conditions of the existing sewer manhole surfaces.

f. Heated, plural component, specially designed equipment for use in the spray or spin-cast application of the specified system approved shall be in conformance with the monolithic surfacing system manufacturers recommendations.

g. Application procedures shall conform to the recommendations of the interior surfacing system manufacturer, including material handling, mixing, and environmental controls during application, safety, and equipment.

h. The equipment shall be specially designated to accurately ratio and apply the specified materials and shall be regularly maintained and in proper working order.

i. The walls and bench of the structure shall be lined with the monolithic surfacing system to provide a thickness as previously specified based on the condition of the existing structure. The cured surfacing shall be monolithic with proper sealing connections to all un-surfaced areas and shall be placed and cured in accordance with the recommendations of the monolithic surfacing system manufacturer.

j. Specially designed spray and/or spin-cast application equipment shall be used to apply each coat of the system.

3.7 Cement Liner and Cement Liner with Epoxy Gel:

A. Packaging and Coverage: The silica fume based mortar shall be available in 50 lb. poly-lined bags – 60 bags per pallet. One 50 lb. bag (22.72 kg) of the silica fume based

mortar shall yield approximately 0.45 cubic feet and cover approximately 10.2 sq. ft. at ½" thickness.

B. Storage: Store in a dry place in accordance with ACI guidelines.

C. Surface Preparation: Surfaces to receive the silica fume based mortar must be cleaned of all oil, grease, rust, scale, deposits and other contaminants to insure a proper bond. Concrete and masonry surfaces can generally be prepared by low (3,500 - 5,000 psi) to high (<5,000 psi) pressure water blasting or abrasive blasting. Excess water should then be removed by air blasting with an oil free air compressor to allow for a clean, damp surface for application of the silica fume based mortar. Any hydrostatic leaks in substrate should be stopped with DJ Hydra Cork, or approved equal.

D. Mixing: For normal brush coat consistency mix 2.5 - 3 quarts of potable water per 50 lb. bag of the silica fume based mortar. For best results mix approximately 3 to 5 minutes with a low speed mortar mixer by first adding water, starting mixer and then adding the silica fume based mortar until mortar is thoroughly mixed.

E. Placement:

1. Dampen all surfaces to which the silica fume based mortar is to be applied to assure proper saturation. For wet process spray applications, the surface to be sprayed must be saturated surface dry and the process should start as soon as achieved.

2. For troweling, the surface to be troweled must be saturated surface dry and all surfaces should be primed with a slurry coat of the silica fume based mortar that is loose enough to be applied with a stiff mason's brush. Scrub the slurry into the substrate and trowel on the silica fume based mortar as soon as the slurry mix becomes tacky to the touch and before it dries.

3. For additional applications of the silica fume based mortar allow first coat to completely dry before applying second coat.

4. The silica fume based mortar shall be wet process sprayed to a thickness of 2" vertically and 1/2" overhead in a single application. For hand troweled applications, the silica fume based mortar shall be capable of being applied up to 3" vertically and 1/2" thick overhead. Minimum thickness for either wet process spray or hand trowel application is 1/2" thick.

3.8 Protective Epoxy Coating:

A. Description: A two-component, solvent-free, moisture insensitive epoxy system. specifically designed for the protection of sanitary manholes, wet wells, and valve vaults. Paste-like viscosity recommended for coating of horizontal, vertical, and overhead surfaces. Non-Sag consistency; will not sag at thickness of .25 inch. The epoxy gel shall be SG-Mastic as manufactured by Dinjer or prior approved equal.

B. Typical Uses: The two component epoxy gel shall be formulated primarily to protect the interior and exterior of manholes, lift stations, and valve vaults against the damaging chemicals prevalent in water and sewer treatment environments.

C. Application Instructions:

1. Limitations: Apply only in good weather, when air and surface temperatures are above 50F and surface temperatures is at least 5 degrees above wet bulb temperature reading. For optimum application properties, maintain product in heated storage between 70 and 90F, or bring this material to this temperature range prior to mixing and application. Dew or rain on mastic while uncured may impair its cure and adhesion of subsequent coats.

2. Surface Preparation: Prepare and coat only clean, dry surfaces.

   a. Steel: Prepare surface in accordance with Steel Structures Painting Council Specification No. 10 "Near White Blast Cleaning" (SSPC-SP 10-63T). Use proper type and size abrasive to attain an average profile depth of 2.0 mils. Do not reuse sand or flint abrasives. Grit or shot abrasives must be cleaned of contamination before reuse. Blow dust and grit from surface with clean, dry air. Coat within 8 hours and before rust or contamination occurs. Apply the epoxy gel as specified directly to properly cleaned steel or over recommended primers. For immersion service, round all welds, sharp edges to a smooth curve and remove all weld spatter before blast cleaning.
   b. Concrete: Surfaces shall be clean, dry, properly cured and free from curing compounds, oil, grease, dirt, chemical contaminant's, waxes or previously applied coatings which are not compatible. Brush blast or water blast to provide an etched surface to remove contaminants and laitants. Remove dust before coating. Apply epoxy gel as specified.
   c. Aluminum and Galvanized: Remove all oil, grease and other contaminants, then lightly brush blast or etch with specified pretreatment. Prime with recommended primer, then apply epoxy gel.

3. Mixing: (Mix only complete units) – "A" Component container is short filled to allow addition of "B" Component. Add the "B" Component and thoroughly blend into Part "A" with mixer for two to three minutes. Allow to stand a minimum of five minutes before application. Usable life of mixed material is function of material temperature. Use within time/temperature limits given in 2.4 A. Pot Life.

4. Thinning: Do not thin.

5. Application: Apply via gloved had and or spatula. Apply to required thickness. After material has achieved an initial set, about 30-40 minutes, using clean glove, dip gloved hand in recommended solvent, solvent applied to glove will smooth previously applied epoxy gel to desired smoothness. Keep glove constantly wet with solvent. Solvent on surface will evaporate quickly.

a. Time Between Coats: Where two coats of epoxy gel are required to achieve the recommended film build, the interval between coats should be as short as possible. To insure maximum inter-coat adhesion it is recommended that: (1) The next coat be applied as soon as possible -after the previous coat is firm. (2) If the previous coat has cured beyond the maximum recoat time given in 2.4 A. Drying Time, uniformly abrade the surface by brush blasting or mechanical grinding to provide an adequate mechanical bond before recoating.

b. Final Curing Times: (Following application of last coat) - For immersion service, 12 hours at 77F or higher. Cure times are proportionately shorter at elevated temperatures and longer at lower temperatures.

6. Cleanup: Clean all equipment immediately after use with an approved cleaner as described by the manufacturer.

7. Continuity Test: The epoxy gel shall be tested for holidays at specified voltage. Holiday detector should be used to check continuity of fully cured film. Consult equipment manufactures voltage recommendation / mil thickness of applied coating. Holiday areas should be sanded or brush blaster, then recoated over abraded areas only.

8. Safety: Refer to material safety data sheets for complete information on safety and handling. Take precautions during application and before coating dries.

Avoid breathing of vapor or spray mist. Avoid contact with eyes and skin. Use a barrier cream on exposed skin. Wash thoroughly after handling. In case of spillage, absorb and dispose of in accordance with local regulations.

Use with adequate ventilation during application and drying. In tanks and other confined areas, use only with adequate forced air ventilation to prevent dangerous concentrations of vapors. Use fresh air masks, clean protective clothing and explosion-proof equipment. Follow OSHA regulations regarding ventilation and respiratory equipment.

9. First Aid: In case of skin contact, wash thoroughly with soap and water; for eyes, flush immediately with plenty of water for 15 minutes and call a physician. If affected by breathing of vapor, move to fresh air. If swallowed, call a physician immediately. Do not induce vomiting.

10. In Case of Fire: Use dry chemical, foam, water fog or C02.

IMPORTANT! Any mixture of Components A and B will have hazards of both Components.

3.9 Manhole Frame and Cover Waterstop: The manhole frame rim shall be free of all dirt and debris prior to the installation of the waterstop insert. The waterstop insert should be fully seated

around the manhole frame rim to insure against water seepage between the insert and manhole frame rim. S.S. tether to be attached to ring anchor.

3.10 Wet Well Cleaning: Clean wet wells in general conformance 3.8, C, 2, b of this Section and in general conformance with Section 05300 – Miscellaneous Utility Items; 3.3; Sandblasting.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Internal Concrete Forming System:

A. Measurement: Internal manhole concrete forming system and FRP liner system, of various depths, including manhole cleaning and preparation, forming system, concrete, plastic T-LOK liner, joint fusing, penetration wraps, clean-up, testing, etc., and including all work, labor, materials, tools, equipment, and incidentals required to complete the work as specified herein and/or as directed by the ENGINEER, will be measured per the Vertical Foot installed and accepted.

B. Payment: Internal manhole concrete forming system and FRP liner system, measured as provided above, will be paid at the Contract unit price per the Vertical Foot for which payments shall provide form complete compensation for the work as measured above, installed in conformance with Contract documents, and per all approved and acceptable practices. (Traffic Control Paid Elsewhere)

C. Pay Item:

PERMAFORM with PVC T-LOK Liner (05260)(01) per Vertical Foot

Manhole Rehabilitation with PVCP 20-46 FRP Liner (4 ft. Diameter SMH) (05260)(02) per Vertical Foot

4.2 Corrosive Resistant Monolithically Applied Coating:

A. Measurement: Corrosive resistant monolithically applied coating, of various set-ups, diameter and depths, including manhole cleaning, preparation, application, clean-up, etc., and including all work, labor, materials, tools, equipment, and incidentals required to complete the work as specified herein and/or as directed by the ENGINEER, will be measured per the Vertical Foot installed and accepted.

B. Payment: Corrosive resistant monolithically applied coating, measured as provided above, will be paid at the Contract unit price per the Vertical Foot for which payments shall provide form complete compensation for the work as measured above, installed in conformance with Contract documents, and per all approved and acceptable practices. (Traffic Control Paid Elsewhere)

C. Pay Item:

Manhole Rehabilitation with 0.15" (150 mils) Th. of 100% Solid Epoxy – 48" Dia. SMH (05260)(03) per Vertical Foot

4.3 Cement Liner:

A. Measurement: Cement liner, including all work, labor, materials, tools, equipment, and incidentals required to complete the work as specified herein and/or as directed by the ENGINEER, will be measured per the Vertical Foot installed and accepted.

B. Payment: Cement liner, measured as provided above, will be paid at the Contract unit price per the Vertical Foot for which payments shall provide form complete compensation for the work as measured above, installed in conformance with Contract documents, and per all approved and acceptable practices. (Traffic Control Paid Elsewhere)

C. Pay Item:

CMS-10K DENJER Cement Liner (05260)(04) per Vertical Foot

½" Th. CMS-10K DENJER Cement Liner with 1.25" Th. S.G. Mastic Epoxy Gel (05260)(05) per Vertical Foot

4.4 Protective Epoxy Coating:

A. Measurement: Protective epoxy coating, including excavation, and including all work, labor, materials, tools, equipment, and incidentals required to complete the work as specified herein and/or as directed by the ENGINEER, will be measured per the Square Foot installed and accepted.

B. Payment: Protective epoxy coating, measured as provided above, will be paid at the Contract unit price per the Square Foot for which payments shall provide form complete compensation for the work as measured above, installed in conformance with Contract documents, and per all approved and acceptable practices. (Traffic Control Paid Elsewhere)

C. Pay Item:

Wet Well Rehabilitation with 0.20" (200 Mils) Th. of 100% Solids Epoxy (05260)(06) per Square Foot

Additional 0.05" (50 Mils) Th. of 100% Solids Epoxy for Wet Well Rehabilitation (05260)(07) per Square Foot

4.5 Manhole Frame and Cover Waterstop:

A. Measurement: Manhole waterstops, including waterstop, gasket, relief valve, tether, etc. and including all work, labor, materials, tools, equipment, and incidentals required to complete the work as specified herein and/or as directed by the ENGINEER, will be measured per the Each installed and accepted.

B. Payment: Manhole waterstops, measured as provided above, will be paid at the Contract unit price per Each for which payments shall provide form complete compensation for the work as measured above, installed in conformance with Contract documents, and per all approved and acceptable practices. (Traffic Control Paid Elsewhere)

C. Pay Item:

Stainless Steel RAINSTOPPER with Stainless Steel Handle (05260)(08) per Each

Stainless Steel TETHERLOK (05260)(09) per Each

4.6 Wet Well Cleaning:

A. Measurement: Wet well cleaning, by any acceptable means, including all work, labor, materials, tools, equipment, and incidentals required to complete the work as specified herein and/or as directed by the ENGINEER, will be measured by the "Third Party Approved Invoice Dollar Amount", cleaned and accepted. This item is a "pass through" item in that the work will be performed by third party personnel. Upon completion, said personnel will invoice the prime Contractor for completed work. This invoice will be included in the prime Contractor Partial Pay Estimate. The Contract Pay Item for this work will include a fifteen (15%) percent mark-up for overhead and profit.

B. Payment: Wet well cleaning, measured as provided above, will be paid at the third party approved invoice dollar amount plus fifteen (15%) percent for overhead and profit for which payments shall provide for complete compensation for the work as measured above.

C. Pay Item:

Clean Wet Well (Pass Through) (Invoice Plus 15%) (05260)(10) per Third Party Approved Invoice Amount

- END OF SECTION -

SECTION 05262

SEWER MANHOLE TOTAL LINING SYSTEM

PART I – GENERAL

1.1 Scope: The work described within details a complete program for wastewater structure lining and rehabilitation. This specification details the methods, procedures, materials and equipment required to produce a total lining system for wastewater structures. The completed system will provide a corrosion resistant liner that restores the surface profile and eliminates water infiltration and exfiltration.

1.2 Applicable Publications: The publications listed below form a part of this specification to the extent referenced. The publication may be referred to in the text by basic designation only.

A. American Society for Testing and Materials:

ASTM D7234 - Adhesion
ASTM D412 - Tensile Strength (PSI)
ASTM D412 - Elongation (%)
ASTM D624 - Tear Strength (PLI)
ASTM D2240 - Hardness
ASTM D522 - Flexibility (1/8" mandrel)
ASTM D4060 - Taber Abrasion (mg loss)

1.3 Submittals: Submit product data in accordance with Section 03340 – Shop Drawings, Samples and Product Data, including but not limited to;

A. Technical Data Sheet on each product used.

B. Safety Data Sheet for each product used.

C. Manufacturer's Certification of CONTRACTOR.

D. Certified CONTRACTOR Minimum Qualifications.

E. Descriptive literature, bulletins and or catalogs of materials.

F. Work procedures including method of repair, etc.

G. CONTRACTORS and Manufacturer warranty forms.

1.4 Quality Assurance:

A. The manufacturer of the total lining system for wastewater structures shall be a company that specializes in the design and manufacture of corrosion protection materials / systems for wastewater structures.

B. The CONTRACTOR shall be completely trained in leak repair, surface preparation and application of the lining system.

C. The materials/products shall be suitable for installation in a wastewater environment without any deterioration of the liner.

D. The CONTRACTOR shall be trained and provide a letter of certification from the manufacturer for the handling, mixing, application, and inspection of the liner system as described herein.

E. To ensure total unit responsibility, all materials and installation thereof shall be furnished by the CONTRACTOR.

PART II - PRODUCTS

2.1 Materials and Equipment:

A. The materials to be utilized in the lining of wastewater structures shall be designed and manufactured to withstand the severe effects a wastewater environment. The manufacturer of the corrosion protection products shall have at least 10 years of experience in the production of the lining products utilized, and the products shall have satisfactory installation record.

B. Equipment for installation of lining materials shall be of high quality and as recommended by the manufacturer.

C. The lining system to be utilized for wastewater structures shall be a multi-layer stress skin panel liner system as described herein:

1. Liner, installation liner, moisture barrier, modified polymer (silicone modified polyurea) surfacer, polyurethane/polymeric blend foam, final corrosion barrier.

2. The modified polymer (silicone modified polyurea) shall be sprayable, solvent free, two-component polymeric, moisture/chemical barrier specifically developed for the corrosive wastewater environment.

3. The polyurethane rigid structure foam, shall be low viscosity two-component, containing flame retardants.

4. Total thickness of multi-layer liner system shall be a minimum of 500 mils (1/2") thick.

D. The product shall be "SPECTRASHIELD" as manufactured by CCI Spectrum, Inc. or approved equal.

PART III – EXECUTION

3.1 Initial Inspection:

A. CONTRACTOR shall take appropriate action to comply with all local, state, and federal regulations including those set forth by OSHA and any other applicable authorities.

B. Prior to conducting any work, an initial inspection of the structure shall be performed to determine need for protection against hazardous gases or oxygen depleted atmosphere and the need for flow control or flow diversion.

C. The CONTRACTOR shall submit a plan for flow control or bypass to the ENGINEER for approval prior to conducting the work.

D. New portland cement structures shall have endured a minimum of 28 days since manufacture prior to commencing installation of the liner system.

3.2 Surface Preparation:

A. The surface preparation will include checking the atmosphere for hydrogen sulfide, methane, low oxygen, or other gases, approved flow control equipment, and surface preparation equipment.

B. Surface preparation for standard manhole structures shall be in accordance with the manufacturer's recommendations, and may include high pressure water cleaning and shall provide a surface compatible for installation of the liner system.

C. Surface preparation and methods for other structures shall be in accordance with the manufacturer's recommendations, and may include high pressure water cleaning, hydro blasting, abrasive blasting, grinding, or detergent water cleaning, and shall be suited to provide a surface compatible for installation of the liner system.

D. The surface preparation method shall produce a cleaned, abraded and sound surface with no evidence of laitance, loose concrete, loose brick, loose mortar, contaminants or debris and shall display a surface profile suitable for application of the liner system in accordance with the manufacturer's recommendations.

E. After completion of surface preparation, perform the seven-point check list, inspecting for:

1. Leaks.
2. Ring and Cover condition.
3. Cracks.
4. Invert Condition.
5. Holes.
6. Inlet and Outlet Pipe Condition.
7. Exposed Rebar.

F. After the defects in the structure are identified, the CONTRACTOR shall repair all leaks and severe cracks with Spectra-Grout, or other methods approved by the manufacturer.

G. Upon completion of leak and crack repair, the surface shall be primed in accordance with the manufacturer's recommendations.

3.3 Material Installation:

A. Application procedures shall conform to recommendations of the manufacturer, including materials handling, mixing, environmental controls during application, safety and spray equipment.

B. Spray equipment shall be specifically designed to accurately ratio and apply the liner system.

C. Application of multi-component liner system shall be in strict accordance with manufacturer's recommendation. Final installation minimum total thickness shall be 500 mils (1/2") thick. A permanent identification and date of work performed shall be affixed to the structure in a readily visible location.

D. A final written report shall be provided to the ENGINEER detailing the location, date of work and description of the work.

3.4 Final Inspection: Final liner system shall be completely free of pinholes or voids. Liner thickness shall be the minimum value as described herein. A visual inspection shall be made by ENGINEER and any deficiencies in the finished liner system shall be marked and repaired

according to the procedures set forth by the manufacturer by the CONTRACTOR at no additional cost to the OWNER.

3.5 Warranty: CONTRACTOR shall warrant the liner system installation against failure for a period of 10 years from the date of acceptance. CONTRACTOR shall correct failures any time prior to 10 years after the installation date. Failure will be deemed to have occurred if the protective liner fails to: (a) prevent the internal corrosion of the structure or (b) prevent groundwater infiltration. Failure does not include damage resulting from mechanical force or the presence of chemical substances not customarily present or used in wastewater structures. The liner must be installed in accordance with Manufacturer's instructions by the CONTRACTOR whom is certified by the Manufacturer. Executed 10-year CONTRACTOR warranty is to be provided upon acceptance of the work.

PART 4 – MEASUREMENT AND PAYMENT

4.1 Manhole Liner:

A. Measurement: SMH lining system, including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Each installed, tested and accepted.

B. Payment: SMH lining system, measured as provided above, will be paid at the Contract unit price per Each for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices. (Traffic Control Paid Elsewhere)

C. Pay Item: Manhole Rehabilitation with SPECTRASHIELD System (05260)(01) per Each.

END OF SECTION

SECTION 05270

RECONSTRUCTION OF SEWER MAINS (8" AND LARGER) BY CURED-IN-PLACE PIPE (CIPP)

PART 1 - GENERAL

1.1 Scope: This Section covers the reconstruction of existing sewer mains by insertion of specified lining product(s) into the main by the cured-in-place-pipe (CIPP) method. It is the intent of this Specification to provide for the reconstruction of existing sewer mains as an alternative method to conventional methods when authorized and/or directed by the ENGINEER by forming a new pipe within an existing structurally deteriorated pipe which has maintained its original shape. The cured-in-place-pipe (CIPP) shall provide flow capacity equal to or greater than 100% of the original pipe's flow capacity when new. The process is defined as the reconstruction of sewer mains by installation of a thermosetting resin impregnated flexible felt fiber tube having an impermeable inner surface. The resin impregnated tube is formed to the main utilizing air pressure or a water column. Curing is accomplished by circulating hot water (or other approved fluid) throughout the length of the tube to cure the thermosetting resin into a hard impermeable pipe in accordance with the specified curing schedule supplied by the resin manufacturer. The CIPP shall extend the length of the original main section to be lined and shall provide a structurally sound, impermeable, jointless, close-fitting pipe that when cured is mechanically bonded to the main pipe.

1.2 Applicable Publications: The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.

A. American Society for Testing and Materials (ASTM) Publications:

D790	Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
D5813	Standard Specification for Cured-in-Place Thermosetting Resin Sewer Piping Systems.
F1216	Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube.
F1743	Standard Practice for Rehabilitation of Existing Pipe Liner and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin CIPP.

1.3 General Corrosion Requirements: The CIPP shall be fabricated from materials which, when cured, will be chemically resistant to withstand internal exposure to domestic sewage.

1.4 Submittals: The following information shall be submitted in accordance with the provisions of Specification Section 03340 - Shop Drawings, Samples and Project Data.

PART 2 - PRODUCTS

2.1 Tube: The CONTRACTOR shall use a thermosetting resin impregnated inversion liner conforming to the requirements of the latest version of ASTM F1216 and ASTM D5813. The tube shall consist of one or more layers or absorbent non-woven fabric capable of carrying resin, and capable of withstanding the installation pressures and curing temperatures. The tube material shall have sufficient strength to bridge missing pipe, be able to stretch to fit irregular pipe sections and negotiate bends. The tube shall be manufactured to a size that when installed will fit tightly in the internal circumference and length of the original pipe. Allowances should be made for circumferential stretching during installation. The outside layer of the tube shall be coated with an impermeable, flexible membrane that will contain the resin and allow the resin impregnation (wet out) procedure to be monitored. The tube shall contain no intermediate or encapsulated elastomeric layers. The inside of the installed tube shall be marked along its full length at regular intervals not to exceed ten (10') feet and shall include the manufacturers name or identifying symbol at least in one location per setup. The wall color of the interior pipe surface of CIPP after installation shall be a light reflective color so that a clear detailed examination with closed circuit television inspection equipment may be made.

2.2 Resin: The resin system shall be a corrosion resistant polyester or vinyl ester system including all required catalysts that provides the cured physical strengths and properties specified herein. The resin shall be cured in the presence of steam or water as specified herein. The resin manufacturer shall provide the CONTRACTOR with their recommended curing cycle and shall submit same to ENGINEER for approval.

2.3 Structural Requirements: When cured the CIPP shall form a mechanical bond with the existing pipe. The CIPP system felt and resin composite shall have the minimum physical properties given below and in accordance with the guidelines in the appendix of ASTM F1216:

1.	Design Life:	50 years
2.	Pipe Diameters:	Per Drawings and Specifications
3.	Ovality:	2%
4.	Pipe Condition:	Fully Deteriorated
5.	External Water:	Ground Surface
6.	Flexural Strength: (ASTM D-790)	4,500 psi
7.	Short Term Flexural Modulus: (ASTM D-790)	250,000 psi
8.	Reduction Factor:	50%
9.	Long Term Flexural Modulus: (ASTM D-790)	125,000 psi
10.	k Enhancement Factor:	7

11.	Soil Modulus:	1,000 psi
12.	Soil Density:	120 pcf
13.	Highway Live Load:	AASHTO HS20-44
14.	Safety Factor:	2 minimum
15.	Min. Thickness (=<10"):	6 mm
16.	Min. Thickness (=>10"):	7.5 mm

*Thickness is rounded to the next higher multiple of 1.5 mm, after adding an allowance of 5% to the design thickness for resin migration.

Any layers of the tube that are not saturated with resin prior to the insertion into the existing pipe shall not be included in the require design structural CIPP wall thickness.

PART 3 - EXECUTION

3.1 General:

A. The length shall be from the inlet to the outlet of the respective manholes, as directed by the ENGINEER. The CONTRACTOR shall verify the lengths in the field before impregnation of the tube with resin. Individual runs shall be as determined in the field by the CONTRACTOR and approved by the ENGINEER.

B. The existing sewers, where designated or required, shall be lined using materials and workmanship which can be adapted to the restrictions of the work site. The CONTRACTOR shall not begin this phase of work until there are sufficient materials on hand to complete the job. The CONTRACTOR shall furnish to the ENGINEER, prior to use of the lining material, satisfactory certification from an approved testing laboratory as to the results of testing the proposed lining material. In addition, satisfactory evidence shall be provided by the CONTRACTOR to the ENGINEER that the proposed lining material will incorporate a resin that is suitable for chemical resistance.

C. The finished CIPP shall be continuous over the entire length of an inversion run of the main line section under repair and be as free as commercially practicable from visual defects such as foreign inclusions, dry spots, pinholes and delamination. Bulges from debris or grease trapped between the CIPP and the main will be cause for rejection. The installation shall also meet the leakage requirements or pressure test specified herein. After the work is completed, the CONTRACTOR will provide the OWNER with a Digital Video Disk (DVD) at no cost to the OWNER showing the completed work including the reestablished service connections.

3.2 Pre-Installation Procedures: The following installation procedures shall be adhered to (regardless of depth) unless otherwise approved by the ENGINEER.

A. Safety: The CONTRACTOR shall carry out his operations in strict accordance with all applicable OSHA standards. Particular attention shall be paid to those safety

requirements involving work on an elevated platform and entry into a confined space or the use of steam.

B. Pre-installation Television Inspection: Refer to Section 05160 – Television (CCTV) Inspection.

C. Pre-insertion Cleaning: Refer to Section 05170 – Sewer Line Cleaning.

D. Bypassing Sewage: Refer to Section 05230 – Gravity Sewer By-Pass Pumping.

E. Protruding Service Connections: When service connections protrude into the existing pipe more than ½" as measured from the inside pipe wall, the CONTRACTOR shall remove the protruding portion of the service connection to within ½" of the inside pipe wall. Removal of the protruding portion of the service connection shall be accomplished using a television camera and internal cutting device, which shall not damage the collection line or the portion of the service lateral to remain in place.

F. Line Obstructions: If Pre-Installation video (TV) inspection reveals an obstruction in the existing sewer (heavy solids, dropped joints, protruding service taps or collapsed pipe) which will prevent completion of the CIPP lining process, and that cannot be removed by conventional sewer cleaning equipment, then the obstruction or defect shall be repaired using the applicable scope of repair work and associated Pay Item.

G. Sags in Line: If Pre-Installation video (TV) inspection reveals a sag in the existing sewer that is greater than one-half the diameter of the existing pipe, then the sag or defect shall be repaired using the applicable scope of repair work and associated Pay Item.

H. Service Reconnections:

1. The CONTRACTOR shall be responsible for continuity of sanitary sewer service to each customer connected to the section of sewer during the execution of the work. If sewage backup occurs and enters buildings, the CONTRACTOR shall be responsible for clean-up, repair, property damage cost and claims.

2. The CONTRACTOR shall present a plan for disconnection and reconnection of the service lines. CONTRACTOR shall use any means necessary to ensure that service lines are reconnected in an expedient manner and that very minimal interruption of services occurs. It shall be the CONTRACTOR_s responsibility to notify affected customers of such interruptions with at least a 48-hour notice.

3.3 CIPP Installation Procedures:

A. Resin Impregnation: The tube shall be vacuum-impregnated with resin (wet out) under controlled conditions. The quantity of resin used for tube impregnation shall be sufficient to fill the volume of air voids in the tube with additional allowances for polymerization shrinkage and the potential loss of resin during installation through cracks and irregularities in the original pipe wall. The CONTRACTOR shall designate a location where the tube will be impregnated ("wet out") with resin using distribution rollers and vacuum to thoroughly saturate the tube felt fiber prior to installation. This

shall be accomplished to ensure that there will be no resin voids or weak areas. The CONTRACTOR shall allow the ENGINEER to inspect the materials and wet out procedure. A catalyst system compatible with the resin and tube shall be used.

B. Insertion: Insert flexible tube through an existing manhole by means of an Inversion Procedure or Pulled-In Procedure. The CONTRACTOR shall prove, prior to beginning of installation, to the satisfaction of the ENGINEER that the Pulled-In Procedure, if used, does not result in tears or abrasion of the tube and uneven distribution of the resin. Connect tube ends by an attachment so that a leak-proof seal is created.

Using the "Inversion Procedure", the flexible tube end shall initially be turned inside out and attached to a platform ring, standpipe, or as approved. The addition of water, air, or steam pressure will be adjusted to sufficient height or pressure to cause the impregnated flexible tube to invert and hold the tube tight against the existing sewer.

Using the "Pulled-In Procedure", a calibration hose shall initially be turned inside out and attached to a platform ring, standpipe, or as approved. The addition of water, air, or steam pressure will be adjusted to sufficient height or pressure to cause the calibration hose to invert and hold the tube tight against the existing sewer, producing dimples at side connections, and flared ends at the manholes. The installed pipe shall extend 6" into the manhole.

3.4 Curing: After the insertion is completed, the CONTRACTOR shall use a hot water recirculation system capable of delivering desired heat uniformly throughout the section to effect a consistent cure of the resin. The curing temperature shall be that recommended by the resin/catalyst system manufacturer. The heat source shall be fitted with suitable monitors to gauge the temperature of the incoming and outgoing water supply. Another such gauge shall be placed between the impregnated tube and the invert of the original pipe at the manhole(s) to determine the temperatures during the resin curing process. Initial cure shall be considered to be hard when the remote temperature sensing device indicates the cure period to be of adequate duration as recommended by the resin/catalyst system manufacturer and approved by the ENGINEER.

3.5 Cool-down: The CONTRACTOR shall cool the hardened CIPP to a temperature below 90 degrees Fahrenheit before relieving the water column. Cool water may be added to the water column while draining hot water from a small hole at the opposite end of the CIPP so that a constant water column height is maintained until cool-down is completed. Care shall be taken in the release of the water column so that a vacuum will not be developed that could damage the newly installed CIPP.

3.6 Finished Pipe: The finished CIPP shall be continuous over the entire length from manhole to manhole and be free from visual defects such as foreign inclusions, dry spots, keel, boat hull, pinholes, wrinkles and other deformities. The liner passing through or terminating in a manhole shall be carefully cut out (also for samples) in a shape and manner approved by the ENGINEER. The area/annular space between the existing main and the CIPP shall be sealed with nonshrink cement grout. During the warranty period, any defect which will affect the integrity or strength of the pipe shall be repaired at the CONTRACTOR's expense, in a manner mutually agreed to.

3.7 Service Connections: After the CIPP has been cured in place, the CONTRACTOR shall reopen the existing active service connections as designated by the ENGINEER. This shall be done without excavation, from the interior of the pipeline by means of a television camera and a cutting device that re-establishes the service connection to not less than 90% capacity. Cutting devices that use high pressure water shall not be used.

3.8 Smoke Testing of Service Lines: Refer to Section 05150 – Smoke Testing.

3.9 Testing: The watertightness of the CIPP shall be gauged by monitoring the water level in the inversion tube while curing. The water testing must be done directly on the finished product and not on an intermediary hose which is not part of the final product. In addition, there shall be no visible evidence of infiltration at the termination point of the liner. This shall be rechecked during the warranty period for conformance. After reopening service connections, the CIPP shall be TV inspected and the DVD and report shall be submitted to the ENGINEER.

For each installation the CONTRACTOR shall submit testing results on a sample of cured liner. The sample shall be taken at termination point opposite the liner entry point on 10% of termination points. Installations to be tested shall be designated by the ENGINEER. If any of the 10% tested fails the test, the ENGINEER reserves the right to require testing of any and/or all CIPP installed at the CONTRACTOR's expense. The testing shall be accomplished by a laboratory approved by the ENGINEER. Whenever required, a short section of sewer pipe shall be placed in the manhole to pass the liner through it under restrained conditions, for later testing and thickness measurements, at no additional cost to the OWNER.

Correction of failed liner or liner deemed unacceptable, as a result of the video inspection, and/or test reports for structural values, thickness, chemical resistance, etc., shall be the responsibility of the CONTRACTOR. Method of correction/repair shall be approved by the ENGINEER with prior field demonstration, if required. It shall be understood that minimum criteria of the specification shall not be lowered to compromise with lower than the required test values, unless approved in writing.

3.10 Patents: The CONTRACTOR shall warrant to the OWNER that the methods, materials and equipment used herein, where covered by license, are furnished in accordance with such license and the prices included in this proposal include applicable royalties and fees in accordance with such license. The CONTRACTOR shall warrant and save harmless the OWNER and ENGINEER against all claims for patent infringement and any loss therefrom.

3.11 Process Limitations: Though the installation process may be licensed or proprietary in nature, the CONTRACTOR shall not change any material, thickness, design values or procedural matters stated or approved in the submittals, without the ENGINEER's prior knowledge and preapproval. The CONTRACTOR shall submit, in writing, full details about component materials, their properties and installation procedures and abide by them fully during the entire course of the project.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Cured-in-Place Pipe (CIPP) Lining:

A. Measurement: Cured-in-Place Pipe (CIPP) Lining shall be measured on a linear foot basis, to the nearest whole foot, measured from center of manhole to center of manhole, for the host pipe sizes listed under this item in the Contract Documents.

B. Payment: Cured-in-Place (CIPP) Lining, measured as provided above, will be paid at the Contract unit price per linear foot for the particular size of host pipe stated which price and payment shall constitute full compensation for sewer flow control, public notifications, traffic control, any required excavation and restoration, installation of the liner, inspection, pre and post-construction TV inspection, post-construction smoke testing, equipment retrieval, testing and cleanup in accordance with the Specifications.

C. Pay Items:

Insertion of 0.10" (2.5 mm) Cured-in-Place Pipe Within Existing 6" Sewers (05270)(01) per Linear Foot

Insertion of 0.24" (6 mm) Cured-in-Place Pipe Within Existing 8" Sewers (05270)(02) per Linear Foot

Insertion of 0.24" (6 mm) Cured-in-Place Pipe Within Existing 10" Sewers (05270)(03) per Linear Foot

Insertion of 0.24" (6 mm) Cured-in-Place Pipe Within Existing 12" Sewers (05270)(04) per Linear Foot

Insertion of .060" (1.5 mm) Thicker Cured-in-Place Pipe Within Existing 12" Sewers (05270)(05) per Linear Foot

Insertion of 0.24" (6 mm) Cured-in-Place Pipe Within Existing 15" Sewers (05270)(06) per Linear Foot

Insertion of 0.06" (1.5 mm) Thicker Cured-in-Place Pipe Within Existing 15" Sewers (05270)(07) per Linear Foot

Insertion of 0.30" (7.5 mm) Cured-in-Place Pipe Within Existing 18" Sewers (05270)(08) per Linear Foot

Insertion of 0.06" (1.5 mm)Thicker Cured-in-Place Pipe Within Existing 18" Sewers (05270)(09) per Linear Foot

Insertion of 0.35" (9 mm) Cured-in-Place Pipe Within Existing 21" Sewers (05270)(10) per Linear Foot

Insertion of 0.06" (1.5 mm) Thicker Cured-in-Place Pipe Within Existing 21" Sewers (05270)(11) per Linear Foot

Insertion of 0.35" (9 mm) Cured-in-Place Pipe Within Existing 24" Sewers (05270)(12) per Linear Foot

Insertion of 0.06" (1.5 mm) Thicker Cured-in-Place Pipe Within Existing 24" Sewers (05270)(13) per Linear Foot

Insertion of 0.35" 9 mm Cured-in-Place Pipe Within Existing 27" Sewers (05270)(14) per Linear Foot

Insertion of 0.06" (1.5 mm) Thicker Cured-in-Place Pipe Within Existing 27" Sewers (05270)(15) per Linear Foot

Insertion of 0.47" (12 mm) Cured-in-Place Pipe Within Existing 30" Sewers (05270)(16) per Linear Foot

Insertion of 0.06" (1.5 mm) Thicker Cured-in-Place Pipe Within Existing 30" Sewers (05270)(17) per Linear Foot

Insertion of 0.53" (13.5 mm) Cured-in-Place Pipe Within Existing 36" Sewers (05270)(18) per Linear Foot

Insertion of 0.06" (1.5 mm) Thicker Cured-in-Place Pipe Within Existing 36" Sewers (05270)(19) per Linear Foot

Insertion of 0.60" (15 mm) Cured-in-Place Pipe Within Existing 48" Sewers (05270)(20) per Linear Foot

Insertion of 0.06" (1.5 mm) Thicker Cured-in-Place Pipe Within Existing 48" Sewers (05270)(21) per Linear Foot

Insertion of 0.65" (16.5 mm) Cured-in-Place Pipe Within Existing 54" Sewers (05270)(22) per Linear Foot

Insertion of 0.06" (1.5 mm) Thicker Cured-in-Place Pipe Within Existing 54" Sewers (052700)(23) per Linear Foot

- END OF SECTION -

SECTION 05272

LATERAL RECONSTRUCTION FROM SEWER MAINS BY C.I.P.P.

PART 1 - GENERAL

1.1 Scope: Work under this item shall consist of reconstruction sanitary sewer service lateral lines, normally without excavation, by the installation of a resin impregnated flexible felt tube inverted into the existing service lateral utilizing an apparatus positioned in the sewer main pipe.

1.2 Submittals: Submit product data in conformance with Section 03340 – Shop Drawings, Submittals and Project Data.

PART 2 - PRODUCTS

2.1 Materials: Refer to Section 05270 – Reconstruction of Sewer Main (8" and Larger) by Cured-In-Place Pipe (C.I.P.P.)

PART 3 - EXECUTION

3.1 General:

A. A resin impregnated tube shall be loaded inside a pressure apparatus aboveground. In the case of a non-man entry pipe, the pressure apparatus shall be attached to a robotic placement device and winched through the sewer main pipe to the service connection. Air supplied to the pressure apparatus shall invert the tube and hold it tightly against the lateral pipe wall. Pressure shall be maintained throughout a heat induced cure by either air/steam pressure, hot water pressure or a combination of both. Upon completion of cure, the pressure apparatus shall be removed leaving a newly formed CIPP.

This method involves the use of standard and non-standard felt tubes and inversion techniques and a seal at the mainline in order to produce a CIPP in the lateral line with one end remotely accessible and the other end inaccessible.

3.2 Curing: Curing shall be accomplished by circulating hot water or other approved method to cure the resin into a hard impermeable pipe. When cured, the pipe should extend over the length of the inversion into a continuous tight-fitting, watertight, pipe-within-a-pipe to effect a seal with the reconstructed pipe. It is the intent that branch connections to buildings be lined from the junction of the sewer main to a specified length upstream (from one foot to five feet), to seal and repair or reinforce the lateral to mainline connection.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Lateral Reconstruction from Main:

A. Measurement: Lateral reconstruction from main line, of the various depths, including excavation and native backfill, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Each service reconstruction installed and accepted.

B. Payment: Lateral reconstruction from main line, measured as provided above, will be paid at the Contract unit price per Each service reconstruction for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices. (Saw-Cut Hard Surfaces paid Elsewhere)(Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere)(Pavement Repair or Replacement Paid Elsewhere)(Select Backfill Paid Elsewhere)(Traffic Control Paid Elsewhere).

C. Pay Item:

0-5 L.F. of Existing 6" Sewer Service Lateral Reconstruction From Existing Sewer Main by Cured-In-Place Pipe (C.I.P.P.) Method (05272)(01) per Each

Trim Protruding Service Lateral Connection (05272)(02) per Each

Remote Cutting of Cured-In-Place Pipe at Service Lateral Connection (05272)(03) per Each

8" Diameter Sewer Main Set-Up for Service Lateral Reconstruction (05272)(04) per Each

- END OF SECTION -

SECTION 05280

RECONSTRUCTION OF SEWER MAINS (8" AND LARGER) BY PIPE BURSTING

PART 1 - GENERAL

1. 1 Scope: This section specifies the method and process for furnishing all labor, materials, tools, equipment, and incidentals necessary to provide for the complete rehabilitation of deteriorated gravity sewer lines by the Pipe Bursting process.

1.2 Description:

A. The Pipe Bursting process is defined as the reconstruction of gravity sewer pipe by installing an approved pipe material, by means of one of the approved processes set forth in this specification. Essentially the process involves the use of a hydraulic moling device or pneumatic hammer of suitable size to break out the old pipe or using a modified boring knife with a flared plug that implodes and crushes the existing sewer pipe. Forward progress of the mole or the knife may be aided by the use of a hydraulic winch. The replacement pipe is either pulled or pushed by means of hydraulic force into place, size on size or upsizing according to manufacturer specifications. The size hammer to be used shall be the minimum diameter necessary to facilitate the restoration process. Oversized hammers shall not be allowed. No pipe bursting restoration will be accepted that has created a sag in the restored line (not previously inherent to the existing line) by oversized hammers or other procedures. The CONTRACTOR shall be responsible for correcting any sags he creates.

B. Sound emissions from the pipe bursting/replacement process shall be limited to 68 decibels (dB) during the installation process. The Contractor shall provide silencers or other devices to reduce machine noise to meet these requirements.

C. Personnel certified as fusion technicians by a manufacturer of polyethylene pipe and/or butt-fusing equipment shall perform polyethylene pipe jointing. Personnel directly involved with installing electrofusion fittings shall be certified by a manufacturer of polyethylene pipe in the proper methods of installing electrofusion fittings. Personnel performing pipe jointing or electrofusion installations shall have prior experience in fusing polyethylene pipe with buttfusion equipment and the installation of electrofusion fittings.

D. The following pipe bursting systems are approved: Innovative Trenchless Systems, Inc., or pre-approved equal.

1.4 Submittals: Submit Shop Drawings, Products and Sample Data in conformance with Section 03340 – Shop Drawings, Samples and Project Data.

1.5 Delivery, Storage, and Handling: Refer to Specification Section 05110 - Gravity Sanitary Sewers and Appurtenances.

1.6 Process Limitations:

A. Though the installation process may be licensed or proprietary in nature, the Contractor shall not change any material, thickness, design values or procedures matters stated or approved in the submittals, without the ENGINEER's prior knowledge and pre-approval. The Contractor shall submit, in writing, full details about component materials, their properties and installation procedures and abide by them fully during the entire course of the project.

B. It is the CONTRACTOR'S responsibility to examine the proposed line segment and notify the ENGINEER if conditions exist that could cause problems with the pipe bursting method. These could include but not be limited to nearby services that could be damaged by the operations, existing slabs that could be damaged, or less than acceptable depth of cover.

PART 2 - PRODUCTS

2.1 Polyethylene Pipe: Refer to Specification Section 05110 - Gravity Sanitary Sewers and Appurtenances. Polyethylene pipe material color shall be gray on the exterior and interior to better accommodate TV inspection.

2.2 Bedding and Haunching: Refer to Specification Section 05110 - Gravity Sanitary Sewers and Appurtenances.

2.3 Full Circle Clamps: Full circle clamps shall be all stainless steel (including bolts and lugs) full circle universal clamp coupling type gasket shall be used, JCM Industries Type 108 or equal. Clamps shall be selected to fit the outside diameter of the replacement pipe. Minimum clamp widths shall be provided in accordance with the following Table:

MINIMUM CLAMP WIDTHS

OUTSIDE DIAMETER OF LINER PIPE (Inches)	MINIMUM WIDTH OF CLAMP (Inches)
7.125	15
8.625	18
10.750 or Greater	30

2.4 Electrofusion Flex Restraint: End restraint of pipe ends shall be achieved by means of Central Plastics Electrofusion Flex Restraints, or approved equal.

PART 3 - EXECUTION

3.1 Preparations: The CONTRACTOR shall submit a work plan to the ENGINEER for review and acceptance. The work plan shall address the following minimum preparation/steps, unless approved otherwise by the ENGINEER.

A. Safety: The CONTRACTOR shall carry out operations under this section in strict accordance with all applicable OSHA Standards. Particular attention is drawn to those safety requirements involving work on an elevated platform and entry into a confined space. It shall be the CONTRACTOR's responsibility to comply with OSHA Standards and Regulations pertaining to all aspects of the work.

B. Pre-installation Television Inspection: 0Refer to Section 05160 – Television (CCTV) Inspection.

C. By Passing Sewage: Refer to Section 05230 – Gravity Sewer By-Pass Pumping.

D. Line Obstructions: If video (TV) inspection reveals an obstruction in the existing sewer (heavy solids, dropped joints, protruding service taps or collapsed pipe) which will prevent completion of the pipe bursting/crushing process, and that cannot be removed by conventional sewer cleaning equipment, then the obstruction or defect shall be repaired using the applicable scope of repair work and associated Pay Item.

E. Sags in Line: If video (TV) inspection reveals a sag in the existing sewer that is greater than one-half the diameter of the existing pipe, then the sag or defect shall be repaired using the applicable scope of repair work and associated Pay Item.

F. Service Reconnections:

1. The CONTRACTOR shall be responsible for continuity of sanitary sewer service to each customer connected to the section of sewer during the execution of the work. If sewage backup occurs and enters buildings, the CONTRACTOR shall be responsible for clean-up, repair, property damage cost and claims.

2. The CONTRACTOR shall present a plan for disconnection and reconnection of the service lines. CONTRACTOR shall use any means necessary to ensure that service lines are reconnected in an expedient manner and that very minimal interruption of services occurs. It shall be the CONTRACTOR's responsibility to notify affected customers of such interruptions with at least a 48-hour notice.

3.2 Installation Process: The CONTRACTOR shall submit information, in detail, of the procedure and the steps to be followed for the installation of the pipe bursting method selected, All such instructions and procedures submitted shall be carefully followed during installation. Any proposed changes in installation procedures shall require submittal of revised procedures and acceptance by the ENGINEER.

A. Insertion or Access Pits:

1. The location and number of insertion pits shall be planned by the CONTRACTOR and submitted in writing for approval by the ENGINEER prior to excavation. The pits shall be located such that their total number shall be minimized and the length of replacement pipe installed in a single pull shall be maximized.

2. Excavation for insertion pits shall not be paid for separately but shall be included in the unit price bid for bursting. Surface removal and replacement shall be performed in accordance with Section 07240 – Street Pavement Replacement and Patching.

B. Pipe Jointing:

1. The polyethylene pipe shall be assembled and joined at the site using the thermal butt-fusion method to provide a leak proof joint. All equipment and procedures used shall be used in strict compliance with the manufacturer's recommendations.

2. The butt-fused joint shall have true alignment and shall have uniform double roll-back beads resulting from the use of proper temperature and pressure. The joint surfaces shall be smooth. The fused joint shall be watertight and shall have tensile strength equal to that of the pipe. All joints shall be subject to acceptance by the ENGINEER and/or his representative prior to insertion. It shall be the sole responsibility of the CONTRACTOR to provide an acceptable butt-fusion joint. All defective joints shall be cut out and replaced at no cost to the Owner.

3. The maximum length of continuous replacement pipe which shall be assembled above ground and pulled on the job site at any one time shall be 600 linear feet.

4. Terminal sections of pipe that are joined within the insertion pit shall be connected with a full circle pipe repair clamp. The ends of the HDPE will be cut smooth and square to the axis, so that they can be joined in a workman like manner such that both ends meet the touch uniformly and continuously. The butt gap between pipe ends shall not exceed one-half (1/2) inch.

C. Finished Pipe:

1. The CONTRACTOR shall install all pulleys, rollers, bumpers, alignment control devices and other equipment required to protect existing manholes, and to protect the polyethylene pipe from damage during installation. Lubrication may be used as recommended by the manufacturer. Under no circumstances shall the pipe be stressed beyond its elastic limit. The winch line must be centered in the existing pipe to be burst with an adjustable boom.

2. The installed replacement pipe shall be continuous over the entire length of each pipe segment from manhole to manhole and shall be free from visual defects such as foreign inclusions, concentrated ridges, discoloration, pitting, varying wall thickness and other deformities. Replacement pipe with gashes, nicks, abrasions, or any such physical damage which may have occurred during storage and/or handling, which are larger/deeper than 10% of the wall thickness shall not be used and shall be removed from the construction site. The installed pipe shall meet the leakage requirements of the pressure test specified herein.

3. The installed polyethylene pipe shall be allowed to relax and cool following installation in accordance with manufacturer's recommended time, but not less than twenty four (24) hours, prior to any reconnection of service lines, connection to manholes, sealing of the annulus, or backfilling of the insertion pit.

3.2 Bedding and Haunching: Bedding and haunching shall be installed in all excavations where the replacement pipe is uncovered (i.e. insertion pits, point repairs). Visual inspection by the ENGINEER is required for approval of bedding before backfill is completed.

3.3 Connections at Manholes:

A. Sufficient excess length of new pipe, not less than four (4) inches or greater than six (6) inches, shall be allowed to protrude into the manhole to provide for end restraint with the use of electrofusion flex restraints. Following the relaxation period, the replacement pipe shall be fitted with a manhole water stop and encased with non-shrink grout to prevent inflow at the manhole.

B. The electrofusion flex restraints shall be placed on top 180 degrees section around the newly installed pipe against the inner manhole wall and fused in place. Installation of all electrofusion flex restraints shall be carried out in strict conformance with the manufacturers printed instructions by personnel certified by a manufacturer of polyethylene pipe in the proper methods of installing electrofusion fittings.

C. The top half of the replacement pipe passing through or terminating within the manhole shall be neatly cut and removed beginning four inches from the manhole walls. The manhole bench and channel may be repaired and/or replaced at the direction of the

ENGINEER. This work shall be performed in accordance with Section 05250 – Miscellaneous Sewer Manhole Repairs.

D. The replacement pipe in the manhole shall be connected and sealed as specified above, and inspected before proceeding on to the next manhole section.

3.4 Service Line Connection Restoration:

A. All sewer service connections shall be identified, located, excavated and disconnected prior to the pipe insertion to expedite reconnection. Upon commencement, pipe insertion shall be continuous and without interruption from one manhole to another, except as approved by the ENGINEER and/or his representative. Upon completion of insertion of the new pipe, the CONTRACTOR shall expedite the reconnection of services so as to minimize any inconvenience to the customers. The following are acceptable service line reconnection methods. CONTRACTOR shall submit selected method for approval. When saddles are used, they shall have enough surface area around the pipe to withstand downward loads.

1. Sewer service connections shall be connected to the new pipe by PVC Saddle Wyes, including all equipment, labor, materials and procedures; and all else incidental thereto required to install PVC saddle wyes.

2. Mechanical saddles shall be made of polyethylene pipe compound that meets the requirements of ASTM D1248, Class C, have stainless steel straps and fasteners, neoprene gasket and backup plate. Mechanical saddles shall be Strap-On-Saddle Type as manufactured by Driscopipe or Tapping Saddle manufactured by Fernco Joint Sealer Co., DFW Plastics, Inc. or approved equal.

3. An HDPE branch saddle may be sidewall fused onto the O.D. of the installed HDPE pipe. This may be done with commercially available sidewall Fusion machine or installed with Unicore HDPE splice under the base of saddle and heated to pipe O.D.

B. PE to PVC transition fittings shall be used as required to tie service connection to customer's line.

C. Sewer service connections shall be connected to the new pipe by mechanical methods. Once the saddle is secured in place, drill hole full inside diameter of saddle outlet in pipe liner.

3.5 Low Pressure Air Testing of the Replacement Pipe:

A. A low-pressure air test of the replacement pipe shall be conducted to check the integrity of the joints that have been made and to verify that the replacement pipe has not been damaged by inserting it into the sanitary sewer.

B. After a manhole-to-manhole section of sanitary sewer main has been pipe bursted and prior to any service lines being connected to the replacement pipe, the pipe shall be plugged at each manhole with pneumatic plugs. The design of the plugs shall be such that they will hold against the test pressure without requiring external blocking or bracing. One of the plugs shall have three air hose connections: one for the inflation of the plug, one for reading the air pressure in the sealed line, and one for introducing air into the sealed line.

C. Low pressure air shall then be introduced into the sealed line until the internal air pressure reaches 4.0 psi greater than the average back pressure resulting from any groundwater that may be over the pipe. At least two minutes shall elapse to allow the pressure to stabilize.

D. The time required for the internal pressure to decrease from 3.5 to 2.5 psig greater than the average back pressure resulting from any groundwater that may be over the pipe, shall not be less than the time shown for a given pipe diameter in the following table. Do not allow the air pressure at any point in the pipe to reach 9.0 psi under any circumstances.

Carrier Pipe Diameter (Inches)	Minimum Elapsed Time (Minutes)
8	4
10	5
12	6
15	7
18	8

E. If the time is less than the allowable time, the pipe will be considered defective and shall be repaired and re-tested at no additional cost to the Owner.

3.6 Smoke Testing of Service Lines: Refer to Section 05150 – Smoke Testing.

3.7 Post Construction TV Inspection of Completed Sections: The pipe bursted sections shall be TV inspected and the DVD and report shall be submitted to the ENGINEER. TV inspection shall employ camera and methods as specified in Section 05160 - Television (CCTV) Inspection. The condition of restored taps shall be inspected and documented. This work shall be included in the Pipe Bursting Pay Items.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Gravity Sanitary Sewers Installed by Pipe Bursting Process:

A. Measurement: Gravity sanitary sewers installed by the pipe bursting process will be measured according to existing pipe diameter-size and new upsized pipe diameter size by the linear foot horizontally along the centerline from center to center of manholes and from center of manhole to end of pipe within the depth bracket of the type of pipe placed,

tested and accepted without deductions for space occupied by manholes, fittings, or other structures.

1. The depth will ordinarily be calculated from elevations taken approximately fifty (50) feet apart on the ground surface or pavement before it is disturbed and from the elevations of invert of the sewer directly below. If either the ground surface or the elevation of the sewer is very irregular, (as in the case of crossing under embankment) the elevations will be taken at extreme points and closer together as may be necessary to determine the depth with sufficient accuracy.

2. The depth of a sewer crossing under a waterway or an open canal will be calculated below a straight line jointing the natural surface on both banks.

3. Sewer pipe installed in casing or by bore and jack will be measured for payment under these pay items as applicable.

4. The unit for each shall include any dewatering or pumping operations that may be necessary or required.

B. Payment: Gravity sanitary sewers placed by pipe bursting method and accepted, measured as provided above, will be paid for at the contract unit price per linear foot for the particular size, type and depth stated which price and payment shall constitute full compensation for furnishing, hauling, and installing complete; for excavation and backfilling, sheeting and bracing, compaction and removing surplus earth; and for furnishing all materials, equipment, tools, labor, hauling, traffic control, signs, barricades, safety items and incidentals; and for inspection, pre and post-construction TV inspection, post-construction smoke testing, equipment retrieval, testing and cleanup necessary to complete this item in accord with the Drawings and Specifications.

C. Pay Item:

Increasing Existing 6" Gravity Sewer Main to 8" P.E. Gravity Sewer Main by Pipe Bursting 0'-8' Depth (05280)(01) per Linear Foot

Increasing Existing 6" Gravity Sewer Main to 8" P.E. Gravity Sewer Main by Pipe Bursting 8'-12' Depth (05280)(02) per Linear Foot

Increasing Existing 6" Gravity Sewer Main to 8" P.E. Gravity Sewer Main by Pipe Bursting 12'-16' Depth (05280)(03) per Linear Foot

Increasing Existing 8" Gravity Sewer Main to 10" P.E. Gravity Sewer Main by Pipe Bursting 0'-8' Depth (05280)(04) per Linear Foot

Increasing Existing 8" Gravity Sewer Main to 10" P.E. Gravity Sewer Main by Pipe Bursting 8'-12' Depth (05280)(05) per Linear Foot

Increasing Existing 8" Gravity Sewer Main to 10" P.E. Gravity Sewer Main by Pipe Bursting 12'-16' Depth (05280)(06) per Linear Foot

Increasing Existing 10" Gravity Sewer Main to 12" P.E. Gravity Sewer Main by Pipe Bursting 0'-8' Depth (05280)(07) per Linear Foot

Increasing Existing 10" Gravity Sewer Main to 12" P.E. Gravity Sewer Main by Pipe Bursting 8'-12' Depth (05280)(08) per Linear Foot

Increasing Existing 10" Gravity Sewer Main to 12" P.E. Gravity Sewer Main by Pipe Bursting 12'-16' Depth (05280)(09) per Linear Foot

Increasing Existing 12" Gravity Sewer Main to 15" P.E. Gravity Sewer Main by Pipe Bursting 0'-8' Depth (05280)(10) per Linear Foot

Increasing Existing 12" Gravity Sewer Main to 15" P.E. Gravity Sewer Main by Pipe Bursting 8'-12' Depth (05280)(11) per Linear Foot

Increasing Existing 12" Gravity Sewer Main to 15" P.E. Gravity Sewer Main by Pipe Bursting 12'-16' Depth (05280)(12) per Linear Foot

BLD "Top Hat" and "Top Hat Plus" C.I.P.P. Lateral Reconstruction From Main Line (05280)(13) per Linear Foot

4.2 Reconnect Existing 4" and 6" Service Line to New PE Pipe Burst Main:

A. Measurement: Reconnection of existing 4" to 6" service lines to new PE pipe burst main, will be measured per Each, including all work, labor, materials, tools, equipment and incidentals required to complete the work including all fittings, couplings, adapters, cutting, drilling, etc., as required to complete the item as specified herein and/or as directed by the ENGINEER.

B. Payment: Reconnection of existing 4" to 6" service lines to new PE pipe burst main, measured as provided above, will be paid at the Contract unit price per Each connection made, tested and accepted

C. Pay Item:

Reconnection of Existing 4" to 6" Service Lines To New PE Pipe Burst Main (0-8' Deep) (05280)(14) per Each

Reconnection of Existing 4" to 6" Service Lines To New PE Pipe Burst Main (8-12' Deep) (05280)(15) per Each

Reconnection of Existing 4" to 6" Service Lines To New PE Pipe Burst Main (12-16' Deep) (05280)(16) per Each

END OF SECTION

SECTION 05290

TEMPORARY FLOW MONITORING AND FLOW ISOLATION

PART 1 - GENERAL

1.1 Scope: This Section covers temporary flow monitoring and flow isolation to identify dry weather base flows independent of I&I and to identify localized areas of likely sources of I&I related base flow occurring in the sanitary sewer system.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 Temporary Flow Monitoring:

A. Purpose: The objective of temporary flow monitoring is to identify and quantify dry weather base flows independent of I&I and to identify localized areas of likely sources of I&I related base flow occurring in the City's Sanitary System. The Work includes:

1. Investigating proposed monitoring sites and confirming suitability.

2. Installing, calibrating, and monitoring temporary flow monitors for limited periods of time (e.g., up to 6 months) at each site.

3. Collecting flow data every week from individual temporary flow monitors.

4. Installing, calibrating and maintaining temporary rain gauges, if any, for limited periods of time (e.g., up to 6 months) at each site.

5. Collecting rain data every week from individual temporary rain gauges.

6. Evaluating the collected data and providing written reports of the temporary flow monitoring results/rain gauge data.

B. Data Processing Recordkeeping: All data generated shall be stored on CD/DVD's, thumb drives, etc. and managed by software designed as provided by the flow meter manufacturer as a data inventory and defect analysis tool, which shall also include a complete data quality consistency check. All data and various outputs shall be made available in hard and electronic copy format.

C. Field Storage Data: Data collected during flow measurement shall be verified then processed and evaluated. The resulting processed databases will then be stored for the duration of the survey. Raw data shall be transferred to computer hard drive storage from CD-ROM or other approved method for immediate or future retrieval by the Engineer.

D. Equipment:

1. The basic instrument used to monitor sanitary sewer flows by the Contractor shall be a temporary flow monitor, as manufactured by MGD, Sigma, or ISCO, equipped with a pressure and velocity sensors or equally approved. The instruments shall be self—contained and record qualitative data. Accuracy shall be +/- 5 percent of actual flow. Each meter shall be field calibrated prior to installation.

2. Rainfall data shall be collected by the Contractor by means of tipping bucket rain gauges. Each unit shall be approved by Engineer, shall include a quartz clock to provide real time synchronized to computer type memory bank, and shall be of the solid-state type. Whenever 0.01 inches of rain is collected, the tipping bucket shall empty, triggering an electronic counter. Every 5 minutes or such other agreed time interval, the timer shall activate the computer and the number of counts shall be recorded on the memory bank. Thus intensity, duration, and time of day of rainfall shall be recorded synchronously.

E. Proper Hydraulics: The Contractor shall ensure that a potential monitoring site's hydraulic suitability is confirmed in order to ensure satisfactory flow monitoring conditions exist. Experienced and trained personnel only shall descend each manhole in order to determine hydraulic suitability for flow measurement. In large lines and combined sewer systems, site investigations will concentrate on where, within a given site, sensors need to be placed to assure the best possible flow quantification and equipment survival. The Contractor's trained field crews shall have the ability to recognize the difference in laminar (streamline flow), backwater and surcharging conditions and to determine the proper flow monitoring techniques required for each location.

F. Sensor Calibration:

1. Strict procedures shall be adopted by the contractor for insuring that the depth of flow is measured and recorded and is accurate to the nearest 1/8th of an inch.

2. Similarly, the velocity sensor shall also undergo vigorous testing prior to use in the sewer. Both the depth and velocity sensors shall be calibrated during site installation.

G. Installation/Maintenance of Flow Monitors: Each temporary flow monitor shall be completely installed following the outlined steps:

1. Site investigation: Identify suitable sites (for monitoring on sewer maps, and then descend manholes in the field until optimum flow hydraulics is identified.

2. Equipment installation: Install ring with sensors and remote unit in the selected manhole.

3. Perform calibration of sensors.

4. Perform weekly site visits to inspect and maintain: Each flow-monitoring site will be visited at least once weekly to collect data. The data will be reviewed on-site to verify the quality of the data. If problems are found, the field crew will address them immediately (e.g., clean sensors, check cables, etc.).

H. Concern Affecting the Ability To Measure Flows:

1. Once the metering plan and sensor locations have been determined in relation to flow measurement the Contractor shall install the meter in accordance with the manufacturer's recommendations and as agreed upon with the Engineer to ensure stability of the monitoring device. Allowable accumulation of debris and allowance for fluctuating flows shall be agreed upon with the Engineer.

2. Particular attention shall be given to special means of anchoring sensors and cables.

I. Quality Control: A rigorous Quality Assurance Program shall be adopted by the Contractor. These aspects shall include:

1. Descending each manhole in order to determine its hydraulic suitability for flow measurement.

2. For temporary monitors, field crews shall make routine visits to perform separate quality assurance checks, including checking the accuracy of the recorded depth versus the actual depth at that time.

3. Each project shall be assigned spare parts and testing equipment, which allow quick diagnoses and repairs of defective monitors. In addition, the Contractor shall provide adequate spare monitors to replace those removed for repair.

4. The Contractor shall submit a log of quality assurance activities performed each month along with the progress payment request that month. All data shall be on CD/DVD, thumb drive, etc., or other as requested by the Engineer.

J. Data Synthesis/Analysis:

1. Flow analysis by the Contractor shall distinguish between pertinent base and peak flows. Subsystems shall be ranked within the sewer system – isolating and identifying I&I areas. The typical data analysis and report package forwarded to the Engineer shall include, but not be limited to, the following:

a. Executive Summary.
b. Field methodologies.
c. System inventory of areas inspected.
d. Long Tables: computer printout of hourly depth of flow readings, hourly quantity of flow in MGD, hourly velocity readings, and hourly rainfall intensities.
e. Hydrographs: plots of all pertinent data collected during the project.
f. Prioritized areas shall be ranked by the amount of extraneous I&I

flow each is receiving.

g. Project database.

h. Supporting field documentation.

2. Two hard copies of the report and two electronic copies of the database shall be provided by the Contractor to the Engineer.

K. Deliverables:

1. Hard copies of the depth and velocity time series plots, depth-velocity scatter graphs, and flow hydrographs (Continuity and Manning's).

2. Calibration/Verification sheets

3. Field daily-logs

4. Final flow data at the conclusion of monitoring (rain, depth, velocity & flow ASCII and/or CSV format) at 5-minute intervals unless otherwise specified, with documentation for the selection of the final flow values.

5. Site reports for monitored manholes

6. Photographs (as available)

7. Monthly quality assurance activities log

L. Experienced Workers:

1. Supervisor of the field crews shall have received proper training in this function and have a minimum of three (3) years experience in performing flow monitoring including safe working practices, access to and decent into confined spaces, etc.

2. Supervisors responsible for supervising flow monitoring field teams shall be fully trained in conducting and documenting this type of work and have a minimum of three (3) years experience in performing these functions.

3.2 Flow Isolation:

A. Work for this Section:

1. The purpose of flow isolation is to identify localized areas of likely sources of infiltration to specific reaches of sewer where flow monitors have indicated specifically high levels of flow relative to base flow. Measurements are typically taken between 12:00 am. and 5:00 am. when base flows are minimal.

2. It is the responsibility of the Contractor to comply with OSHA regulations, the City's Safety Guidelines, and the City's Confined Space Guidelines as applicable.

3. The Contractor shall provide all labor, material, supplies, equipment, and transportation necessary to complete flow isolation inspections.

B. Experienced Workers:

1. Supervisor of the field crews shall have received proper training in this function and have a minimum of three (3) years experience in performing Flow Isolation including safe working practices, access to and decent into confined spaces, etc.

2. Supervisors responsible for supervising Flow Isolation field teams shall be fully trained in conducting and documenting this type of work and have a minimum of three (3) years experience in performing these functions.

C. Methodology:

1. Graduated V-notch weirs or depth/velocity measurements are the only approved means and shall be used to determine flow rate during flow isolation. Floating objects are not acceptable to estimate mean flow velocity. Computation of mean velocity using sewer slope and measured depth of flow is not acceptable.

2. All flow isolation field measurements shall be conducted between 12:00 AM. and 5:00 AM. local time on a micro-system of sewers with a total length of approximately 1,000 linear feet. Contractor will plug all pipes upstream of the test segment or differentially isolate the segments.

D. Documentation:

1. The Contractor shall document all observations regarding each flow isolation test in a report. The report shall include the following information at a minimum:

a. Date and time.
b. Location, including reference to the City manhole numbering system and street address.
c. Testing personnel.
d. Schematic layout of the manholes and sewer lines under testing, showing location of the weir.
e. Pipe Sizes and lengths.

2. Prior to measuring flows Contractor will perform an area survey to identify and document businesses and/or institutions that typically have high discharge rates to the sewer, such as hospitals, laundries/cleaners, food establishments, clubs, etc.

E. Public Notification: Public notification is critical and compliance with the public notification criteria is a prerequisite for conducting flow isolation when conducting flow isolation tests on sewers in easements which pass through private property. At a minimum, the following steps shall be taken:

1. Residential/Commercial: Distribute advance notice flyers between 24 and 72 hours before flow isolation commences for each section of pipe.

2. Emergency Response Agency (Fire, Police): Set up contact person and notify daily as to area, start time, and ending time.

3. Schools, Hospitals, and Nursing Homes: Distribute advance notice flyers between 24 and 72 hours before flow isolation.

4. The Contractor shall keep a daily log of his contact with all affected agencies and institutions.

F. Deliverables:

1. Electronic database of flow isolation data and digital photographs of results shall be submitted to the Engineer. The electronic database using the required file format in Microsoft Access and any and any all other data format requested by the ENGINEER.

2. A binder with hard copies of the flow isolation reports including photos shall be submitted to the Engineer.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Temporary Flow Monitoring: All cost for providing, installation, and maintenance of temporary flow meters, documentation and public noticing, including but not limited to labor, equipment, transportation, tools and all other related procedures and materials necessary to produce the results in the form, format and of the quality specified in the Temporary Flow Monitoring section. Flow meters shall remain in place and produce acceptable data quality for a period of 90 calendar days for the unit Proposal price.

4.2 Temporary Rain Gauge Monitoring: All cost for providing, installation, and maintenance of temporary rain gauges and documentation, including but not limited to labor, equipment, transportation, tools and all other related procedures and materials necessary to produce the results in the form, format and of the quality specified in this Section. Rain gauges shall remain in place and produce acceptable data quality for a period of 90 calendar days for the unit Contract price.

4.3 Flow Isolation: All cost for flow isolation, documentation and public noticing, including but not limited to labor, equipment, transportation, tools and all other related procedures and materials necessary to produce the results in the form, format and of the quality specified in this Section. Payment will be for each Flow Isolation set up.

4.4 Temporary Flow Monitoring Data Delivery: All costs for preparing and delivering data, data summaries, graphs and images associated with temporary flow monitoring will be included

in the Contract unit price, including but not limited to labor, equipment, transportation, tools and all other related procedures and materials necessary to produce the results in the form, format and of the quality specified in this Section.

4.5 Rain Gauge Monitoring Data Delivery: All costs for preparing and delivering data, data summaries, graphs and images associated with rain gauge monitoring will be included in the Contract unit price, including but not limited to labor, equipment, transportation, tools and all other related procedures and materials necessary to produce the results in the form, format and of the quality specified in this Section.

4.6 Flow Isolation Data Delivery: All costs for preparing and delivering data and images associated with flow isolation will be included in the Contract unit price, including but not limited to labor, equipment, transportation, tools and all other related procedures and materials necessary to produce the results in the form, format and of the quality specified in this Section.

4.7 Payment: Temporary flow monitoring and flow isolation, measured as provided above, will be paid at the Contract unit price described as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices. (Traffic Control Paid Elsewhere).

4.8 Pay Item:

Flow Metering for 30 Day Period of Open Channel Flow Monitoring (05290)(01) per Each 30 Day Period

Extended Open Channel Flow Monitoring (03290)(02) per 24 Hour Day

Event Recorder for 30 Day Period of Lift Station Flow Monitoring (05290)(03) per Each 30 Day Period

Extended Lift Station Flow Monitoring (03290)(04) per 24 Hour Day

Rain Gauge and/or Rainfall Metering Device for 30 Day Period of Rainfall (05290)(05) per Each 30 Day Period

Extended Rain Gauge or Rainfall Metering Device Measurement (05290)(06) per 24 Hour Day

Temporary Flow Monitoring (1-5 Flow Meters) (05290)(07) per Flow Meter/Day (M/D)

Temporary Flow Monitoring (1-5 Flow Meters) (05290)(08) After 60 Days per 24 Hour Day

Temporary Flow Monitoring (6-10 Flow Meters) (052900)(09) Flow Meter/Day (M/D)

Temporary Flow Monitoring (6-10 Flow Meters) (05290)(10) After 60 Days per 24 Hour Day

Temporary Flow Monitoring (11-15 Flow Meters) (05290)(11) per Flow Meter/Day (M/D)

Temporary Flow Monitoring (11-15 Flow Meters) (05290)(12) After 60 Days per 24 Hour Day

Temporary Flow Monitoring (16 or More Flow Meters) (05290)(13) per Flow Meter/Day (M/D)

Temporary Flow Monitoring (16 or More Flow Meters) (05290)(14) After 60 Days per 24 Hour Day

Rain Gauges (05290)(15) per 24 Hour Day

4.9 Night Flow Isolation:

A. Measurement: Night flow isolation including all work, labor materials, tools, equipment and incidentals required to complete the work will be measured by the "Third Party Approved Invoice Dollar Amount". This is a "pass through" item in that the work will be performed by third party personnel. Upon completion, said personnel will invoice the prime Contractor for completed work. This invoice will be included in the prime Contractor Partial Pay Estimate. The Contract Pay Item for this work will include a fifteen (15%) percent mark-up for overhead and profit.

B. Payment: Night flow isolation, measured as provided above, will be paid at the third party approved invoiced dollar amount plus fifteen (15%) percent for overhead and profit for which payments shall provide for complete compensation for the work as measured above.

C. Pay Item: Night Flow Insolation (Pass Through) (Invoice Plus 15%) (05290)(16) per Third Party Approved Invoice Amount

- END OF SECTION -

SECTION 05300

MISCELLANEOUS UTILITY ITEMS

PART 1 - GENERAL

1.1 Scope: This Section covers the requirements for miscellaneous utility items not covered elsewhere including electronic markers, service markers, vacuum testing, sand blasting, etc. and including all work, labor, materials, tools, equipment and incidentals required to comply the work as specified herein and/or as directed by the ENGINEER.

1.2 Submittals: Submit product data in conformance with Section 03340 – Shop Drawings, Samples and Product Data.

PART 2 - PRODUCTS

2.1 Electronic Utility Location Marker: The utility marker shall be high density polyethylene solid molded. Deflection range shall be a minimum of five (5') feet. Units shall be 4 ½" overall diameter, spherical detection field, welded leak tight housing, 400 lb. uniform load tested, chemical resistant, interior foam and a frequency tolerance of ±0.35%. The units shall be Green, Blue and/or Red. Green "Sewer" at 122 kHz; Blue "Water" at 146 KHz; and Red "Electric" at 170 kHz.

2.2 Utility Marker Locator: Locator shall be battery operated (20 hr. minimum) rechargable, 30.7" L. x 7.8" W. x 12.8" H, -4 to 122 degree operating temperature, and weight of 4.5 lbs. Unit shall be capable of locating 7 different marker types simultaneously, user adjustable detection threshold, digital signed processor, bar graph-numerical and audible signal, strength indicator, adjustable volume, headphone jack, battery level indicator and low battery warning, adjustable time-out and totally weatherproof.

PART 3 - EXECUTION

3.1 Markers and Locators: Install markers and operate locator in strict conformance with manufacturer's requirements.

3.2 Vacuum Testing: Perform sewer manhole vacuum testing in accordance with ASTM C1244. Testing procedure shall be as follows:

A. Temporarily plug all pipes entering the manhole. Each plug must be installed at a location beyond the manhole/pipe gasket (i.e. outside the manhole wall), and shall be braced to prevent the plug or pipe from being drawn into the manhole.

B. The test head shall be placed inside the rim of the cast iron frame at the top of the manhole and inflated in accordance with the manufacturer's recommendations.

C. A vacuum of at least ten inches of mercury (10" Hg) shall be drawn on the manhole. Shut the valve on the vacuum line to the manhole and shut off the pump or disconnect the vacuum line from the pump.

D. The pressure gauge shall be liquid filled, having a 3.5-inch diameter face with a reading from zero to thirty inches of mercury.

E. The manhole shall be considered to pass the vacuum test if the vacuum reading does not drop more than 1" Hg (i.e. from 10" Hg to 9" Hg) during the following minimum test times:

Minimum Test Times for Various Manhole Diameters			
MH Depth (feet)	**4' Diameter MH**	**5' Diameter MH**	**6' Diameter MH**
15 Feet or Less	50 sec.	1 min. 5 sec.	1 min. 20 sec.
15.01 to 30 Feet	1 min. 20 sec.	1 min. 45 sec.	2 min. 10 sec.

F. If a manhole fails the vacuum test, the manhole shall be repaired with a non-shrinkable grout or other material or method approved by the ENGINEER. The manhole surface shall be properly prepared prior to any repairs. Once the repair material has cured according to the manufacturer's recommendations the vacuum test shall be repeated. This process shall continue until a satisfactory test is obtained.

G. All temporary plugs and braces shall be removed after each test.

3.3 Sandblasting: Sandblast sewer manholes and wet pits interior to remove oil, grease, laitance, chemicals, loose concrete or grout and all other objectionable debris or surface films. As best as possible, follow guidelines of SSPC-SP 13 and ICRI Guideline 03730.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Electronic Utility Location Markers:

A. Measurement: Utility markers, including all work, labor, materials, tools, equipment, and incidentals required to complete the work as specified herein and/or as directed by the ENGINEER, will be measured per Each provided and demonstrated.

B. Payment: Utility markers, measured as provided above, will be paid at the Contract unit price per Each, for which payments shall provide form complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices.

C. Pay Item: Electronic Service Locator Markers (05300)(01) per Each.

4.2 Utility Marker Locator:

A. Measurement: Utility marker locator, including all work, labor, materials, tools, equipment, and incidentals required to complete the work as specified herein and/or as directed by the ENGINEER, will be measured per Each provided and demonstrated.

B. Payment: Utility marker locator, measured as provided above, will be paid at the Contract unit price per Each, for which payments shall provide form complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices.

C. Pay Item: Electronic Marker Locator (05300)(02) per Each

4.3 SMH Vacuum Testing:

A. Measurement: SMH Vacuum testing, including all work, labor, materials, tools, equipment, and incidentals required to complete the work as specified herein and/or as directed by the ENGINEER, will be measured per Each manhole tested and passed.

B. Payment: Vacuum testing, measured as provided above, will be paid at the Contract unit price per Each, for which payments shall provide form complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices.

C. Pay Item: SMH Vacuum Testing (05300)(03) per Each.

4.4 Sandblasting:

A. Measurement: Sandblasting, including all work, labor, materials, tools, equipment, and incidentals required to complete the work as specified herein and/or as directed by the ENGINEER, will be measured per Third Party Approved Invoiced Dollar Amount. This is a "pass through" item in that the work will be performed by third party personnel. Upon completion, said personnel will invoice the prime Contractor for hours worked. This invoice will be included in the prime Contractor Partial Pay Estimate. The Contract Pay Item for this work will include a fifteen (15%) percent mark-up for overhead and profit.

B. Payment: Sandblasting, measured as provided above, will be paid at the third party approved invoiced dollar amount plus fifteen (15%) percent for overhead and profit, for which payments shall provide form complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices.

C. Pay Item: Sandblasting (Pass Through)(Invoice Plus 15%) (05300)(04) per Third Party Approved Invoiced Dollar Amount.

- END OF SECTION -

SECTION 05310

SEWER LIFT STATION CONTROL PANEL

PART 1 - GENERAL

1.1 Description: This section covers a complete Pump Station Electrical Control Systems as hereinafter described and all necessary appurtenances which might normally be considered a part of the complete electrical system for this installation. It shall be factory assembled, wired and tested and covered by complete electrical drawings and instructions. Control panels shall accommodate 3 phase, 480 V, up to 25 Horsepower.

1.2 Quality Assurance and Qualifications:

A. To assure unity of responsibility, the pump control panels shall be furnished by the pump supplier. The CONTRACTOR and the manufacturer shall assume responsibility for the satisfactory installation and operation of the entire pumping system including pumps, motors, starters and controls as specified.

B. The Supplier shall maintain quality in design and workmanship as well as materials used in manufacture of equipment supplied. All equipment supplied under this Contract shall be of new manufacture.

C. The Supplier shall be a firm that is engaged in the manufacturing of process control systems. The system shall be in regular production with pre-designed hardware and software for process control systems. When the specification conflicts with a manufacturer's standard system, the standard system may be furnished if the intention of the specification is met.

D. System shall be a standard system. Custom one of a kind application software and customized hardware components will not be accepted. A standard system is defined as one which is available, at time of bid, with fully tested hardware and software, full documentation, and prepared training classes such that no development must be done beyond system configuration.

E. Supplier shall be responsible for detailed engineering, manufacture, programming, test, start-up and demonstration of all equipment and software programs to the Owner to provide a complete operating system.

F. The manufacturer shall have been continuously involved in the design and manufacture of control systems for the past ten (10) years. The manufacturer shall have successfully built and placed into operation, systems similar to the one proposed herein and will furnish a list of at least ten (10) operating installations upon request by the Engineer.

G. Provide all engineering and render coordination assistance, necessary for calibration of overall control system and to resolve interface discrepancies between panels, equipment, instrumentation and final control devices. Where interface conflicts exist, the Supplier shall document conflicts in writing to the OWNER providing absolute information such as terminal

numbers, device name, tests performed and diagnosis of problem.

H. Equipment supplied shall be of the most current and proven design at the time of delivery. The completed System and the equipment provided by the Supplier shall be compatible with the functions required and shall be a complete working System.

I. Electrical components of the Control System shall operate on 120 volt, single- phase, 60 Hertz current, except as otherwise noted. Line voltage supply shall be 480 VAC three phase, or as required.

J. Signal conditioning, setpoint, control, alternation, logic function, transducer, alarm and all other control functions shall be performed by solid-state modules which shall be standard catalog items of the system manufacturer, with proven field performance.

K. At least one module of each type used in the system shall be stocked by the system manufacturer for system expansions or renewal parts purposes. The modules shall be of a compatible, integrated control family with a full range of control/protective/alternation/ telemetry capabilities and associated housings, enclosure system and appurtenances to perform a variety of functions required by this project and foreseeable expansion. It is the intention of this specification to disallow non-standard, "one of a kind", experimental, unproven combinations of equipment.

L. The control unit shall be standard products manufactured and stocked by the control supplier in order to assure one source responsibility, ready availability, proper system interconnections and reliable, long-term operation.

1.3 Submittals: Submit product data in accordance with provisions of Section 03340 – Shop Drawings, Samples, Samples, and Project Data for specified equipment to include at least the following:

A. The complete assembly shall be provided with job-specific wiring diagrams, parts lists, enclosure dimensional and door layout drawings and instructions.

B. Production Schematics shall be submitted for approval for all equipment herein specified. The Production Schematics Submittal shall include a Document List. An Order Specification shall be included which shall describe in detail the major functionality of the equipment being provided as well as components used detailed down to major component level. Each panel shall be provided with a job-specific wiring diagram, parts list, enclosure door layout and enclosure dimension drawing. Manufacturer's wiring diagrams that are not job-specific (standard drawings with options crossed out, etc.) are not acceptable. The wiring diagram requirement applies to all field mounted instrumentation and control equipment. Interconnection details shall be shown for all field-mounted instrumentation. A Description of Operation shall be provided detailing the operation of the complete system, including the control and alarm handling.

C. Certification of U.L. listing of Control Center.

D. Provide As-built Drawings and Instruction Manuals. These manuals shall include corrected Shop Drawings. In addition, a detailed Programming and Operations Manual for the Microprocessor-based Controller Unit shall be included. The manual shall include all information as detailed for the Shop Drawing Submittals above.

1.4 Selected Equipment/Approved Equal: The controls specified under this section are as manufactured by Primex Controls and Xylem Water Solutions as locally represented by Gulf States Engineering Co., Inc. of Covington, Louisiana (318-445-6810).

1.5 Operation and Maintenance Manuals: Complete Operation and Maintenance Manuals shall be provided in accordance with Section 03800 – Operation and Maintenance Data.

1.6 Startup Services: The services of a factory trained, qualified representative shall be provided to inspect the completed installation, make all adjustments necessary to place the system in trouble-free operation and instruct the operating personnel in the proper care and operation of the equipment. After each system has been installed, the Supplier shall demonstrate with performance of each unit, and document that the system operates properly as specified. The Supplier shall provide systems training for operations staff totaling no less than 2 hours. All training shall be conducted at the site. Travel expenses are the responsibility of the supplier.

1.7 Equipment Guaranty: Equipment shall be guaranteed against defects in material and workmanship for a period of two (2) years from the date of Owner's final inspection and acceptance to the effect that any defective equipment shall be repaired or replaced without cost or obligation to the Owner.

PART 2 - PRODUCTS

2.1 General Requirements:

A. U. L. Serialized Label

1. The control panel(s) shall be constructed in compliance with Underwriter's Laboratories Categories 698A and 913 standards – "Enclosed Industrial Control Panel Relating to Hazardous Locations with Intrinsically Safe Circuit Extensions" listing and following-up service. The control panel(s) shall bear the Underwriter's Laboratories serialized label for "Enclosed Industrial Control Panel Relating to Hazardous Locations with Intrinsically Safe Circuit Extensions".

2. Prior to shipment from the manufacturer's facility to the jobsite for installation, an Underwriter's Laboratories (U.L.) representative shall inspect the completed control panel(s). Upon successful completion of the inspection, the panel shall be assigned the required "Enclosed Industrial Control Panel Relating to Hazardous Locations with Intrinsically Safe Circuit Extensions" serialized U.L. label, indicating the equipment is built in accordance with the practices and requirements of the Underwriter's Laboratories 698A and 913 categories.

3. While the use of U.L. listed components is encouraged, their use alone and/or the alternate use of a U.L. 508A – "Enclosed Industrial Control Panel" serialized label will not be considered an acceptable or satisfactory alternate to the "Enclosed Industrial Control Panel Relating to Hazardous Locations with Intrinsically Safe Circuit Extensions" serialized label specified above. Upon request from the Engineer, the panel manufacturer shall supply documentation to the owner proving they are a U.L. recognized manufacturing facility for the type of equipment required. Only the labeled products of U.L.698A and 913 "Enclosed Industrial Control Panel Relating to Hazardous Locations with Intrinsically Safe Circuit Extensions" recognized panel manufacturer shall be considered acceptable for use on this project.

B. Wiring:

1. Wiring shall be minimum 600 volt UL type MTW or AWM and have a current-carrying capacity of not less than 125% of the full load current. The conductors shall be in complete conformity with the national electric codes, state, local and NEMA electrical standards. For ease of servicing and maintenance, all wiring shall be color-coded. The wire color code shall be clearly shown on the drawings, with each wire's color indicated. In addition, the equipment wiring shall be permanently marked with wire numbers that correspond to the system schematics. The numbering convention shall comply with the municipal industry standard.

2. Control wiring shall be contained within plastic/PVC wiring duct with covers. Where dimensional constraints prevent the use of wiring duct, wires shall be trained to panel components in groupings. The wire groupings shall be bundled and tied not less than every 3 inches with nylon self-locking cable ties as manufactured by Panduit or equal.

3. Every other cable tie shall be fastened to the enclosure door or inner device panel with a cable tie mounting plate with pressure tape. Where wiring crosses hinged areas such as when trained from the inner device panel to the enclosure door, spiral wrap shall be used.

C. Lightning Arrestor:

1. A lightning arrestor shall be supplied in the control system and connected to each line of the load side of main power disconnect. The arrestor shall protect the control system against damage as the result of transient voltage surges caused by lightning interference, switching loads and power line interference's. It shall begin shunting to ground at 1000 volts maximum.

2. Each panel shall be supplied with a properly sized control power circuit breaker. The breaker shall supply power to all control wiring within the enclosure.

D. Nameplates: All major components and sub-assemblies shall be identified as to function with laminated, engraved bakelite nameplates, or similar approved means.

2.2 Control System and Control Panel:

A. Enclosure:

1. The described equipment shall be housed in a NEMA Type 3R, AISI 304 Stainless Steel enclosure. The enclosure door shall be provided with a padlock-able hasp and aluminum dead front operator's inner door.

2. This weatherproof, rain-tight enclosure shall be designed specifically for mounting in an unprotected outdoor location. It shall have a gasketed, hinged, front weather door with locking capability, and an internally mounted hinged dead front panel so that all the components normally actuated by Operating Personnel are accessible without opening the dead front and yet are not exposed to the elements or to unauthorized personnel.

B. Incoming Power Connections: The control panel shall include a power distribution terminal block for connection of the incoming service.

C. Control Panel Power: The control panel shall derive control power from the station's service 480 V, 3 phase service location. 120 VAC power shall be used to power control panel.

D. Pump "Run" Lights:

1. The control panel shall have pump running lights mounted on the front door, one for each pump, as well as three VFD fault lights, one for each VFD.

2. Provide a single "Lamp Test" pushbutton with dual-input lights for all specified conditions. Door-mounted indicator lights shall be the LED type, NEMA 4x rated.

E. Siemens LC150 Pump Controller:

1. A new microprocessor based pump controller shall be furnished for monitoring and automatically controlling pumps in a pump down mode of operation in response to wet well level. Unit shall be capable of open protocol (MODBUS) communications.

2. The unit shall be a standard, catalogued product of a water and wastewater pumping automation equipment manufacturer regularly engaged in the design and manufacture of such equipment. The unit shall be specifically designed for water and wastewater pumping automation utilizing built-in preconfigured control and telemetry strategies allowing pump up or down mode pump control of 1 to 4 pumps. "One of a kind" systems using custom software with a generic programmable controller will not be acceptable.

3. The operating program shall be resident in non-volatile FLASH memory and include full-scale ranging and pump-up/down determination. The controller shall be arranged to operate up to four (4) pumps plus high and low (analog) alarms. The ON and OFF adjustments of each pump and alarm set-point shall be full-range adjustable through use of an authorized operator access code and a keypad. The controller display

shall show the operation of each control stage.

4. The controller shall include keypad adjustable on-delay timing logic to provide staggered pump starting following a power failure condition. Keypad adjustable off delay timing for each pump control stage shall provide smooth transition between control stages.

5. The unit shall be able to operate on either 120 AC or 10–30 VDC power sources. The unit shall be battery backed to provide continued system monitoring and alarm annunciation in the event of primary power failure. Unit shall have built in battery charging circuitry to maintain and charge battery. Battery shall be sized to provide a minimum of 4 hours of back up power. Back up battery power will extend to necessary process sensors, local alarm lights, horns and telemetry equipment. A power on LED shall be built on board providing local indication that power is available to the unit.

6. The unit shall be furnished with a user friendly operator interface allowing adjustment and viewing of all system parameters and status with a cursory visual inspection. The operator interface shall be NEMA 4X rated suitable for front door mounting including locations requiring mounting in outdoor or corrosive environments without damage:

7. The unit shall provide on board 24 VDC loop power output for external loop powered sensor. A built-in Analog Supply Voltage Status LED shall indicate availability of loop power. Unit shall be able to monitor a user selectable – 4-20 mA or 0-10 Volt analog input representing the process to be controlled. The analog digital conversion shall not be less than 16 digit to allow display of process to (XX.X). The analog input circuitry shall provide optical isolation from the main board to the field device. A minimum of 1000 volts electrical isolation shall be required. The Analog process signal shall be displayed locally via 40 segment vertical LED display and the LCD digital display as specified above. This signal shall also be available for telemetry transmission.

8. The unit shall have the ability to monitor up to 16 digital inputs to be used to provide monitoring of local station status. Each discrete input shall provide optical isolation from the main board to the field device. A minimum of 1500 volts electrical isolation shall be required. An on board LED shall be provided indicating that digital Input isolation is not compromised. All discrete inputs shall be available for telemetry transmission. The following inputs shall be monitored:

- Pump 1-4 Run – This signal shall be used to provide local display of pump run status, pump total run time, pump average daily starts. For each pump.
- Pump 1-4 In Auto – This signal shall be used by the controller to determine pump availability. A pump *not* in this mode, cannot be called into operation.
- Pump 1-4 High Temperature/Seal Failure – These signals shall be used by the controller to disable the affected pump when a High Temperature Signal is received from the pump, and provide local alarm display. Controller shall be able to differentiate High Temperature and Seal Failure alarms. . A Seal Failure shall be reported as an alarm, and shall also disable the affected pump operation.

A High Temperature alarm or a Seal Failure alarm from one pump shall not affect the normal operation of the remaining pumps.

- High & Low Float/Pressure – This signal shall be used by the controller to provide back up control of the pumps in the event of primary (analog) sensor failure.
- Pump Inhibit – This signal shall be used by the controller to inhibit pumps from operating
- Power Quality – This signal shall be used by the controller to disable pumps in the event incoming station power is unsuitable for use as determined by the external alarm disabling switch.
- Door Switch & Door Acknowledge– These signals shall be used by the controller to monitor station access as detected by an external door/limit switch and an external alarm disabling switch.
- Alarm Silence – This signal shall be used by the controller to monitor an external silence push button and will temporarily disable the alarm horn output.

9. The LCD display screen shall operate in a manual scrolling menu mode with the various displays shown in sequence as selected by the keypad's up/down arrow keys. The display shall indicate the specific function entered on the keypad to confirm that selection of a particular output or other function from the keypad during adjustment or review routines.

10. The unit shall be protected from unauthorized changes via built-in system security. The unit shall support 3 levels of security in a hierarchical structure allowing different levels of access to the unit for differentiation of desired assess levels to include Operator, Maintenance, & Supervisory access levels.

11. The unit shall provide outputs for interface to local pumps and alarm annunciation equipment. Relay isolated contact outputs for activation of pumps 1-4, Common Alarm and Alarm Horn shall be provided. Each contact shall be rated for a minimum of 10 amps at 120 VAC or 5 Amps at 240 VAC. Open collector outputs for Low and High Level Alarm shall be provided for interface to off board monitoring equipment. Open collector outputs shall have a minimum operating range of 5-30 VDC @ 100 mA.

12. The unit shall be capable of providing 4-20 mA output signal for interface to external equipment and monitoring devices. Analog output can be configured to provide output representing process variable for retransmission or as a process control output for interface to VFDs, valves, or other process controlled device.

13. The unit shall support contact closure inputs from float or pressure switches representing high and low (*Level*). The unit shall annunciate these inputs as alarms and use them to provide back up control in the event the primary (analog) sensor fails. Unit will provide local alarm indication and utilize the inputs to cycle pumps on and off to maintain system operation.

14. The unit shall have built-in standard operator adjustable alternation functions allowing for sequencing and equalizing wear of the pumps. The following alternation sequences shall be supported:

- Fixed
- Rotary
- First On First Off (FOFO)
- Utilize One Favor Others (UOFO)
- Emergency Mode (FOFO the pump on high level)

15. The unit shall include built-in Pump Failure detection logic. In the event the pump has been called into operation and the pump run signal is not received within a pre-adjustable time period. A motor failure shall be produced. The failed motor shall be disabled, an alarm shall be displayed and the next available pump based on the selected alternation sequence shall be requested to start.

16. The controller shall include built in site intrusion detection logic that will monitor an external sensor (motion sensor, door switch, etc.) and allow authorized access to the station via controller keypad entry of proper security code or access level. The intrusion system upon detection of entry, will allow a preset amount of time for the operator to go the controller keypad and enter the proper code. When the operator logs out and leaves the facility, the controller shall allow a preset amount of time for the operator to get out before re-arming.

17. In addition to the pump and alarm control capability, the controller shall provide alarm annunciation. The controller shall, upon the occurrence of an alarm, sound an audible device and flash the alpha-numeric display. The display will indicate the alarm description, complete with the time and date of the alarm occurrence. An acknowledge pushbutton shall be provided to allow silencing of the audible device while the digital display will continue to show the alarm function, complete with time and date information, until the condition has cleared. A built-in alarm and status historian shall retain the last 100 time and date stamped events providing a historical record of recent activity.

18. The unit shall have one (1) RS-232C serial communications port that shall be available for telemetry communications. The RS-232 serial port shall support completely open communication standards. Unit shall support communication data rates of 1,200 to 38,800 baud rates. On board communication diagnostic LEDs shall be available to provide indication of communications activity for verification and troubleshooting.

19. Unit shall be constructed for industrial applications for use in harsh environments. Unit shall have a Temperature Operating range of -40 to + 85 Deg C, and be able to operate in environments with 10-90% non condensing humidity. Unit shall be UL Listed and in compliance with FCC part 15 Class A emissions and CE IEC61000 Surge Withstand certifications.

20. All connections shall be made via plug-in terminal blocks with a minimal rating of 10 Amps, 300 Volts and capable of accepting 30-12 AWG wire.

21. It is the intention of this specification that a standard controller/transceiver be provided, with all of the control and communications features described as a fully-integrated assembly.

22. The pump controller shall contain all relays and electronic equipment required to interface with each pump motor thermal protection and seal failure switches. The pump controller shall also be furnished with all relays and electronic devices required to interface with the solid state motor overload relays, and motor contactor auxiliary switches.

23. The pump controller shall contain two float backup controllers, each equal to Primex PC240. Each float backup controller shall operate from a single float, located above normal operating levels, with an adjustable timer to determine pump operating time.

2.3 External Components:

A. Motor Circuit Breakers: Provide a thermal magnetic circuit breaker in a NEMA 12 enclosure for each sewage pump. Provide a handle on the exterior of each enclosure to operate the breaker. The handle shall have provisions for Lock-Out/Tag-Out. Breaker ratings shall be as required to accommodate 480 V, 3 phase, up to 25 horsepower.

B. Variable Frequency Drives (VFDs): VFDs shall be Danfoss VLT Aqua Type, in IP55/NEMA 12 Enclosure.

C. Interconnecting Wiring: Contractor shall provide all interconnecting wiring between these external components and the Pump Station Control Panel to provide for proper operation of the system.

2.4.1 Variable Frequency Drives:

A. A Variable Frequency pump drive shall be provided for each pump in the system, sized for the appropriate voltage and power. The pump drive shall be supplied by the pump manufacturer and designed for wastewater pumping and with functionality pre-programmed for the specific pump model used or a PLC of equivalent functionality shall be provided. The pump drive shall provide all level control functionality, hand/auto operation, pump alternation, pump over temperature monitoring, seal leakage monitoring, pump self-cleaning, sump cleaning and pipe cleaning algorithms. The pump drive shall also include capability to monitor station inflow, pump speed and energy consumption in order to automatically operate the pump station at optimal energy efficiency.

The pump drive shall be tested and approved in accordance with national and international standards and comply with Directive 98/37/EC, Safety of Machinery and EN60204-1. It shall

conform to the relevant safety provisions of the Low Voltage Directive 2006/95/EC and the EMC Directive 2004/108/EC and has been designed and manufactured in accordance with the following harmonized European standards:

EN 61800-5-1: 2003	Adjustable speed electrical power drive systems. Safety requirements. Electrical, thermal and energy.
EN 61800-3 2nd Ed: 2004	Adjustable speed electrical power drive systems. EMC requirements and specific test methods
EN 55011: 2007	Limits and Methods of measurement of radio disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment (EMC)
EN60529 : 1992	Specifications for degrees of protection provided by enclosures

The variable frequency drive ampere rating shall be equal to or greater than the ampere rating listed on the motor being driven by the variable frequency drive.

B. The drive units shall be modularly constructed. Printed circuit boards shall be connected in such manner that they are easily removed from the unit. Power components shall be readily accessible and be connected in such manner that they are easily removed from the unit. The pump drive shall be freestanding for wall mounting or cabinet installation construction, for 480V, 60HZ 3Phase power supply up to 25 horsepower. It shall hold an IP55 and IP66 isolation class.

2.5 System Operation – VFD or PLC functionality

A. High/Low Level Sump Control: The pump controls system shall provide automatic level control via means of a submersible pressure transducer (4-20mADC) and one (1) non-mercury liquid level float switch. User-programmable Start Level shall indicate the point at which the pump will start. Upon activation the pump shall run at maximum speed for a pre-determined period, then ramp down to the energy efficient Optimal speed, calculated by the pump drive. When the water level reaches the Stop Level, the pump shall stop. The Optimal Speed shall either be calculated by the pump drive or manually entered by the user.

In case of high inflow, the pump drive shall increase pump speed until the water level begins to decrease. When the water level reaches the Stop Level, the pump shall stop.

In case of very high inflow, in a duplex installation, when a single pump is unable to overcome the inflow conditions even at maximum speed, additional pumps shall be activated and run at maximum speed until the Stop Level is reached. If water levels continue to rise, a High Level Alarm shall be activated.

The pump drive shall incorporate a Minimum Speed function that prevents the pump from operating at speeds too low to move water based on the pump curve.

B. Run Time Averaging (Duplex Application Only): In cases of duplex pumps/drives, the pump drive shall provide capability to balance run times for even wear. This shall be an internal function of the drive and not require external devices, such as an Alternating Relay. The function shall operate by determining a "random" start level based on the Start Level setting. Each drive shall determine its own random start level independent of each other. New random start levels will be determined every 24 hours. The pump with the lowest random start level shall be first to start on any given pump cycle. The second pump shall remain in Standby capacity in case the lead pump shall not be able to lower the water level as described in the section above. By recalculating the random start levels every 24 hours, balanced run times are accomplished.

C. Energy Efficient Speed Finder: The pump drive shall provide a function that automatically calculates the most energy efficient speed for the pump based on station inflow characteristics. An algorithm calculates the optimal speed whereby the most water is pumped using the least amount of energy, the optimal speed is constantly adjusted to account for changes inflow without requiring operator adjustment, multiple setpoints, etc.

The energy efficient function prevents the drive from running off of the system curve for the pump. This will ensure maximum hydraulic efficiency as well as electrical efficiency is maintained.

D. Alarms & Monitoring: The pump drive shall provide alarms and monitoring for the drive, pump and sump. Alarms shall be presented on the LCD display, via a Summary Alarm relay and via Modbus registers. All alarms, when occurring, shall remain active until reset. Alarms shall have a built-in 4 second delay to prevent nuisance tripping. Alarms shall be as follows:

- Pump Monitoring:
  - Pump Over Temperature (thermal contacts in motor stator)
  - Pump Seal Leak (Flygt FLS leakage sensor)
- Sump Monitoring:
  - High Sump Level (via level float switch or submersible transducer)
  - Submersible transducer Sensor Error (Submersible transducer is not connected, reports faulty values or the wrong start level is used)
- Pump drive Monitoring (includes, but not limited to):
  - Drive Overcurrent
  - Drive Overload Trip
  - Drive Undervoltage
  - Drive Overvoltage
  - Drive Overtemperature (Internal)
  - Drive Overtemperature (ambient)
  - Drive Undertemperature (ambient)
  - Input Phase Loss
  - Drive Output Max Torque Exceeded

2.6 Pump Station Manager: The station controller shall have the following features, at a minimum:

A. Intelligent hand-off auto switch for each Concertor Pumping System (CPS).

B. User configurable liquid level setpoints for CPS activation and deactivation.

C. User configurable liquid level setpoints for high level, high-high level, low level and low-low level.

D. Alternation options including but not limited to:
1. Lead/lag
2. Fixed
3. Jockey/duty
4. Most energy efficient as lead in an N to 1 ratio
5. N to 1
6. N to M

E. Inputs and Outputs
1. Twenty (20) zero-volt digital inputs
2. Seven (7) relay outputs rated at 240V, 5 amps with a resistive load and 2 amps with an inductive load.
3. Two (2) analog inputs with 12 bit resolution.
4. One (1) analog output with 12 bit resolution
5. Three phase voltage monitoring up to 600V

F. Six (6) unique setpoint profiles to allow for different modes of station operation. The profiles can be activated by digital input, SCADA command, timer, or user selection. At a minimum the followings items shall automatically change when a profile is changed:
1. Pump activation setpoints
2. Pump deactivation setpoints
3. The maximum number of pumps allowed to run

G. The following station optimization features shall be pre-configured:
1. Odor reduction feature that forces a pump start after an operator configurable timer runs out and there is sufficient fluid to start a CPS. The initial timer shall be set to 2 hours.
2. Fat buildup minimization feature that uses a random lead pump start delay timer. The timer shall be initially set to 60 seconds.
3. A sump cleaning function that will run the CPS to the snore point based on an operator configurable number of pump cycles and/or an operator configurable timer. The number of cycles shall be initially set to 12 and the timer shall be initially set to 9 hours.
4. The CPS shall automatically detect a blockage and automatically clear the blockage. The station controller shall monitor the status and annunciate an alarm should one be reported by the CPS.
5. The station controller shall have an energy minimizer function that minimizes the amount of energy used per pumping cycle.

8. Communications shall be setup to each CPS gateway to retrieve operating metrics and faults.

H. Inflow and out flow monitoring with any one of the following options:
1. Calculate the inflow and outflow by liquid level draw down method.
2. Analog input from a flow meter to monitor flow rate.
3. Pulsed signal from a flow meter to measure flow volume.
4. Simultaneous analog and pulsed signals from a flow meter.

I. Integrated data logger with:
1. Capacity for recording up to 50,000 events
2. Ability to download events to a USB storage device
3. Ability to download events to an SD storage device
4. Ability to log millions of events to a SD or USB storage device

J. Three phase voltage supply monitoring faults for:
1. Under voltage
2. Over voltage
3. Voltage phase imbalance

K. Monitoring and logging of DC power supply voltage.

L. Monitoring and logging of controller internal temperature.

M. Faults on the controller shall be configurable for:
1. Pump holdout
2. Pump lockout with automatic reset
3. Pump lockout with manual reset
4. Hidden fault
5. Automatically resetting fault

2.7 Human Machine Interface: A keypad display compatible with the pump station manager and shall have the following features at a minimum:

A. Home screen displayed parameters must include

B. Information Screen that show the following information:

1. Hours Run counter for each pump and the pump station to include:
a. Minutes run for last pump cycle
b. Total minutes (hourly)
c. Total hours today, total hours yesterday
d. Total hours this week, total hours last week
e. Total accumulated hours

2. Pump Start counter for each pump and the pump station including:
   a. Pump starts this hour, pump starts last hour
   b. Pump starts today, pump starts yesterday
   c. Pump starts this week, pump starts last week
   d. Total accumulated pump starts

3. Flow Values (when enabled by software key)
   a. Station inflow rate
   b. Pump flow rate
   c. Total station volume
   d. Overflow data (including overflow start time, duration, estimated volume)

4. Power and efficiency:
   a. Pump efficiency in gallons per KWHr
   b. Power in KW
   c. Power factor
   d. Energy accumulators per pump in HWHr

5. Insulation resistance value for each pump motor in Ohms.

6. I/O Status
   a. Digital I/O status and accumulated values
   b. Analog I/O status with a vaule in mA and a scaled value
   c. 3 phase voltage, frequency, phase angle, power factor

7. Database viewer function to review statistics and tag data information in real time.

C. Context based help that explains each settings and information screen.

D. Ability to configure the controller without a laptop and configure the following parameters at a minimum.

1. Set point programming of pump activation/deactivation values and level alarm values.
2. Enable/Disable level alarms, faults and historical data recording
3. Configuration of Inputs and Outputs
4. Setup parameters for each type of fault available in the pump controller
5. Set alternation mode for pumps
6. Configure station optimization parameters
7. Configure voltage supply monitoring parameters
8. Configure motor monitoring parameters
9. Configure communications parameters
10. Configure data logging parameters
11. Enable level simulation session
12. Create or restore backup copies of the pump controller configuration settings

13. Restart the pump controller

2.8 Concertor Pumping System Gateway: A Concertor DP gateway shall be supplied for each Concertor Pumping System (CPS) with the following features:

A. Pump communications interface port for communicating the following information to the CPS at a minimum:
   1. Start and stop commands
   2. Power consumption information
   3. Operating speed
   4. Running status
   5. Fault information

B. Inputs and outputs:
   1. Four (4) digital inputs
   2. Four (4) relay outputs
   3. One (1) analog input
   4. One (1) analog output

C. Modbus TCP and RTU communications

2.9 Surge Suppression: A 480VAC three phase surge suppression device shall be installed in line with the supply voltage with the following features:

A. Each input shall have a nominal AC operating voltage of 480VAC
B. Meet UL 1449 4th edition requirements
C. Meet IEC 61643-11 requirements
D. Response time <1ms
E. Nominal discharge current: 20kA 8/20 µs
F. Maximum discharge current: 50kA 8/20 µs
G. Maximum surge capacity: 60kA 8/20 µs
H. Voltage protection rating: 1500V
I. Voltage protection level: 1700V
J. Residual voltage at 10kA (8/20 µs): 1395V
K. Operating frequency range: 0-500Hz
L. Operating temperature: -40°C to +85°C

2.10 UPS: Provide a 24VDC power supply with battery backup capable of running al DC loads for a minimum of 1 hour.

2.11 Local Alarm System: A remote mounted weatherproof, strobe alarm indication light assembly with shatter resistant polycarbonate red lens mounted on a polycarbonate/ABS blend case shall be provided. The alarm light shall be NEMA 4X rated, suitable for indoor or outdoor mounting and operate on 120 VAC and be PLC rated. The strobe tube shall provide a minimum of 300,000 peak candela output and shall be rated for 3,000 hour life. The alarm light shall flash upon occurrence of an alarm condition. The unit shall shipped separately and connected via terminal strip in the pump control panel.

2.12 Condensation Protective Heater: A 100 watt, 120 VAC condensation protective heater and adjustable high temperature cutout thermoswitch shall be supplied in the control panel. The heater's surface area for heat dissipation shall be large enough to prevent a skin burn (if an operator's hand should inadvertently come in contact with the unit when energized). The heater shall be regulated by a humidistat located within the control panel enclosure.

2.13 Back-Up Level Control: Backup sump level controls shall be a float system operated by two (2) float switches. The float switches shall be utilized for pump stop and pump start/high water level. The float switches shall be mechanical type switch, potted in a solid polyurethane float, with two (2) conductor No. 16 flexible cord (Type SJOW). Float switches shall be normally open type with contacts rated at 3 amps for 115 or 230 volts.

PART 3 - EXECUTION

3.1 Inspection:

A. Inspect all equipment upon arrival at job site and prior to installation. Notify manufacturer of any damage and/or shortage.

B. Inspect concrete mounting pads and anchor bolts for correct size and alignment prior to installation.

3.2 Panel Protection: The pump control panel shall be protected at all times. The pump control panel shall be maintained in an upright position at all times. Lifting shall be only at the floor sills or the top mounting lifting angles. All nameplates shall be properly protected during painting. Equipment and material shall be suitably delivered and stored and shall be readily accessible for inspection. All items subject to moisture damage shall be stored in dry spaces. All material and equipment shall be protected against dirt, dust, water and chemical or mechanical injury, vandalism and theft.

3.3 Field Wiring: Field installed interior wiring shall be neatly grouped by circuit and bound by plastic tie wraps. Circuit groups shall be supported such that circuit termination points are not stressed.

3.4 Installation:

A. Installation shall be in strict accordance with the manufacturer's instructions and recommendations.

B. The CONTRACTOR shall submit a certificate from the equipment manufacturer stating that the installation of the equipment is satisfactory, that the equipment is ready for operation, and that the operating personnel have been suitably instructed in the operation, lubrication and care of each unit.

3.5 Inspection and Testing:

A. General:

1. The ENGINEER shall have the right to inspect, test or witness tests of all materials or equipment to be furnished under these Specifications, prior to their shipment from the point of manufacturer.

2. The ENGINEER shall be notified in writing prior to initial shipment, in ample time so that arrangements can be made for inspection by the ENGINEER.

3. Field tests shall not be conducted until such time that the entire installation is complete and ready for testing.

PART 4 – MEAUREMENT AND PAYMENT

4.1 Sewer Lift Station Control Panel

A. Measurement: Sewer lift station control panels as specified herein and including all work, labor, materials, tools, equipment and incidentals required to complete the and or as directed by the ENGINEER, will be measured per Each.

B. Payment: Sewer lift station control panels, measured as provided above, will be paid at the Contract unit price per Each, installed and accepted.

C. Pay Items: Consolidated Electric Sewer Lift Station Control Panel (3 Phase, 480 V, Up to 25 HP) (05310)(01) per Each

- END OF SECTION -

CITY OF ALEXANDRIA, LOUISIANA

ANNUAL REQUIREMENTS CONTRACT FOR WATER, WASTEWATER, NATURAL GAS AND GENERAL (SITE RELATED) SYSTEMS 2026

PART 6 – NATURAL GAS

Section 06110 - NATURAL GAS DISTRIBUTION

SECTION 06110

NATURAL GAS DISTRIBUTION

PART 1 - GENERAL

1.1 Scope: The CONTRACTOR shall furnish all labor, materials, tools, equipment, and incidentals as required to perform all operations necessary for installation of natural gas services and appurtenances as specified herein, and or as directed by the ENGINEER.

1.2 Submittals: Submit product data in accordance with Section 03340 – Shop Drawings, Samples and Project Data.

1.3 Product Delivery, Storage and Handling:

A. Inspection of Material at Delivery Point:

1. When delivered to the site, and prior to unloading, the CONTRACTOR shall inspect all pipe, valves, valve boxes and meters, and accessories for loss, damage or lack of specified identification and markings.

2. Any defective or improper material shall be immediately marked and shall not be unloaded.

B. Handling: In shipping, storing and installing pipe, valves and accessories shall be kept in a sound, undamaged condition. They shall, at all time, be handled with care and shall not be dropped, dumped or bumped against any other object. Any material(s) damaged shall be marked and immediately removed from the job site.

C. Storing:

1. Pipe shall be stored off the ground on pallets.

2. Valves, meter boxes, couplings, fittings, etc. shall be kept clean and dry.

D. Defective Materials: All materials found at any time during the progress of the work to have cracks, flaws or other defects will be rejected and marked and the CONTRACTOR shall promptly remove such defective material from the work site.

1.4 Acceptable Materials: Materials listed in PART 2 - PRODUCTS of this Section are the only acceptable models and manufacturers for construction of the City of Alexandria Gas Distribution System OWNER. No substitution of materials is permitted.

1.5 Applicable Publications: The transportation of natural gas by pipeline shall conform to the Natural Gas Pipeline Safety Act of 1986. The Act required the U.S. Department of Transportation (DOT), Office of Pipeline Safety (OPS) to develop and enforce minimum safety regulations for the transportation of natural gas by pipeline. These regulations became effective in 1970 and are published in Title 49, Code of Federal Regulations, Parts 190, 191, and 192. Other publications

(latest revisions), listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references.

1.6 American Gas Association (A.G.A.) Publications:

A.G.A. Plastic Pipe Manual for Gas Service, February, 1985.

1.7 American National Standards Institute (ANSI) Standards:

ANSI B1.20.1	Pipe Threads, General Purpose (Inch)
ANSI B16.3	Malleable Iron Threaded Fittings, Class 150 and 300
ANSI B16.5	Steel Pipe Flanges and Flanged Fittings
ANSI B16.9	Factory Made Wrought Steel Butt weld Fittings
ANSI B16.33	Manually Operated Metallic Gas Valves for use in Gas Piping Systems Up to 125 psig
ANSI B31.8	Gas Transmission and Distribution Piping Systems, 1989 Edition
ANSI B31.8a	1990 Addenda to ANSI B31.8

1.8 The American Petroleum Institute (API) Specifications:

5L	Specification for Line Pipe
5LE	Specification for Polyethylene Line Pipe
6D	Pipeline Valves, End Closures, Connectors and Swivels
Standard 1104	Standard for Welding Pipelines and Related Facilities

1.9 American Railway Architecting Association (A.R.E.A.) Specifications:

A.R.E.A. Manual for Railway Architecting (Fixed Properties), Volume I.

1.10 American Society of Mechanical Architect's (ASME) Publications:

ASME Boiler and Pressure Vessel Code and Interpretation: Section IX, Welding Brazing Qualifications, 1983.

1.11 American Society for Testing and Materials (ASTM) Standard Specifications:

A53	Black and Hot-Dipped, Zinc-Coated, Welded and Seamless Steel Pipe
A181	Carbon Steel Forgings for General Purpose Piping
A216	Carbon Steel Castings Suitable for High Temperature Service
A234	Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
D1598	Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure
D2513	Thermoplastic Gas Pressure Pipe, Tubing, and Fittings
D3350	Polyethylene Plastics Pipe and Fittings Materials

1.12 U. S. Department of Transportation (DOT), Office of Pipeline Safety (OPS):

Title 49 Code of Federal Regulations (CFR), PARTS 40 and 199	Drug Testing

(See Attachment "A" – Drug Testing)

PART 2 - PRODUCTS

2.1 Steel Pipe, Joints, Fittings:

A. Steel Gas Pipe. Steel gas pipe shall be new and conform to the requirements of ASTM A53, Grade B, Type E or S; or API Specifications 5L, Grade B, line pipe, seamless or electric-resistance welded, black; wall thickness as required to meet ANSI B31.8. New steel pipe shall be in lengths, not less than 20 feet long, with plain ends beveled for welding.

B. The exterior of the pipe shall have 11 mil minimum thickness "Scotchkote," type 3M 206N, Fostercoat, or approved equal, plant applied fusion bonded epoxy coating meeting the SPECIFICATIONS contained in NAPCA Bulletin 12-78-90, and subsequent revisions thereto.

Each length of steel pipe shall be marked in accordance with API Specifications 5L, namely to show name or mark of the manufacturer; pipe size (outside diameter) in inches; weight per foot; grade; API Monogram; pipe length; process of manufacturer; type of steel; heat treatment and hydrostatic test pressure.

All steel gas pipe shall be of domestic manufacture and shall be standard schedule 40, with a weight and wall thickness as follows:

Size (Inch)	Weight (lbs./L.F.)	Wall Thickness (Inches)
10	40.48	0.365
8	28.55	0.322
6	18.97	0.28
4	10.79	0.237
3	7.58	0.216
2	3.652	0.154
1-½	2.717	0.145
1	1.678	0.133

C. Joints: Joints for steel gas pipe shall be butt-welded to develop a joint that will result in complete fusion throughout the entire wall thickness of the pipe. All butt-welds shall be full penetration single butt-welds in accordance with D.O.T. Part 192 and API Standard 1104. Welded joints shall satisfactorily hold any pressure that the line will be subjected to in testing or during operations at maximum design pressure.

D. Mitre joints shall be limited to pipe connections where commercially fabricated welding fittings cannot be used and then shall be made in segments limiting the deflection in each section to angles agreed upon by the ENGINEER.

E. All threaded pipe, nipples, fittings, union, and couplings shall be made up tight to valves, regulators, meters using Rector Seal No. 5 pipe dope, graphite joint sealing compounds for gas service listed in Underwriters Laboratories, Inc. Gas and Oil Equipment Director, Class 20 or less, polytetraful-oroethylene tape, which conforms to Military (Mil.) Specifications (Spec.) Mil-T-27730, or approved equal.

F. Fittings: Steel gas pipe threaded fittings shall conform to ANSI B16.3 or B16.11, black. Steel gas pipe butt-welded fittings shall conform to ANSI B16.9 and shall be commercially fabricated steel fittings of pressure rating equal to or greater than ANSI Class 150 standards. All pipe bends shall be long radius type.

The exterior of all bends and fittings shall have the same coating as the pipe. Where reduction of size in pipes occur concentric swage fittings shall be used. Steel gas pipe flanged fittings shall conform to ANSI B1.20.1.

1. PE. to Steel Transition Fitting. The PE. to steel transition fitting shall be manufactured by the same manufacturer of the PE. piping supplied for the system.

The PE. ends of the fitting shall conform to paragraph 2.1.4(C) of these SPECIFICATIONS. The fitting shall be manufactured by Wayne Manufacturing, Central Plastics, or approved equal.

Upon completion of welding operations for the transition fitting, the steel ends of the fitting shall be thoroughly coated as specified in paragraph 3.1.13(E) of these SPECIFICATIONS. The cost for installation of each such transition fitting shall be included in the unit price bid for associated items of work.

2. Stopple Fitting. Stopple fittings (short stop) shall be manufactured by T. D. Williamson, Inc., Mueller Co., or approved equal, and consist of a pipe cap, completion plug, and a shaped steel nipple.

The CONTRACTOR shall be required to provide all the necessary tapping and plugging equipment required to install the stopple.

Unless shown otherwise on the PLANS, all stopple fittings shall be welded connections. Where indicated, the stopple shall be mechanically fitted.

The cost for installation of each stopple fitting and the cost of any required tapping and plugging equipment shall be included in the unit price bid for hot tap connections, per each.

3. Three Way Tee Fitting. Three way tee fitting (3-way tee) shall be manufactured by T. D. Williamson, Inc., Mueller Co., or approved equal, and consist of a forged steel blind flange with gaskets, nuts and bolts; a cast iron completion plug, and a cast steel fitting meeting ASTM A216 Grade WCB for 4" and larger sizes and consist of a pipe cap, completion plug, and three way tee with external pipe threads, shaped to fit the pipe for 3" and smaller sizes. The fitting shall be designed to conform to ANSI Class 150 standards. The three-way tee shall be used to connect new lines to the existing steel lines that are to remain in service.

The CONTRACTOR shall be required to provide all the necessary tapping and plugging equipment required to install the three way tee fitting.

Unless shown otherwise on the PLANS, all three way tees shall be welded connections. Where indicated, the tees shall be mechanically fitted.

The cost for installation of each three way tee and the cost of any required tapping and plugging equipment shall be included in the unit price bid for hot tap connections, per each.

G. Bolts, Nuts, Etc.: Bolts shall be as specified by the USAS B31.8 specifications for bolted joints or as recommended by the pipe manufacturer; all subject to approval of the ENGINEER. All bolts on flanged pipe installed underground shall be made from a non-corrosive metal subject to the approval of the ENGINEER.

2.2 Thermoplastic Gas Pressure Pipe, Joints, Fittings:

A. Polyethylene (PE.) Plastic Pipe: All thermoplastic gas pressure pipe furnished shall be polyethylene (PE.) plastic pipe and shall conform in all respects to ASTM D2513.

Polyethylene plastic pipe shall be manufactured from a virgin polyethylene plastic compound material which meets ASTM D2513 for use with natural gas, and has the primary physical properties which are identified by cell classification PE. 355434C in accordance with ASTM D3350 and has been listed by the Plastic Pipe Institute (P.P.I.) as a PE. 4710 designated compound.

All PE. pipes shall be of a single manufacturer. All PE. plastic pipes shall be SDR 11, unless otherwise specified. The pipe must be furnished in the Iron Pipe Size (IPS).

All PE. pipes shall have the manufacturer's name or trademark, the nominal pipe size, the PPI plastic pipe designation code, and the Standard Dimensional Ratio (SDR) or wall thickness conspicuously marked at intervals of not more than 2 feet.

B. Joints: Joints shall be made using butt heat-fusion equipment and instructions provided by or recommended by the pipe manufacturer.

Buss heat-fusion joints will require the use of a jointing device that holds the heater element square to the ends of the piping, can compress the heated ends together, and holds the piping in proper alignment while the plastic hardens.

C. Fittings: All polyethylene gas pipe fittings shall conform to ASTM D2513 and paragraph 2.2.A of these SPECIFICATIONS.

PE. to steel transition fittings shall be as specified in paragraph 2.1.C.1 of these SPECIFICATIONS.

D. Polyethylene Plastic Pipe: Polyethylene plastic pipe shall be manufactured by Phillips Driscopipe, Inc. – Driscopipe 8100.

2.3 Service Line: All gas service line (pipe) shall be a minimum of one-inch (1") diameter and shall conform to Paragraph 2.2.A of these SPECIFICATIONS. All service line(s) shall extend from the gas main to, and including, the point of delivery. The point of delivery is the service meter stop. Service line shall be coated and wrapped from bottom of the service meter stop or from a point at least one foot (1') above ground level to a point at least one foot (1') below the ground level.

2.4 Welded Steel Casing Pipe: Steel casing pipe shall be new and conform to the requirements of ASTM A53, Grade 13, Type E or 5; or API Specification 5L, Grade B., line pipe, seamless or electric-resistance-welded, black. Steel casing pipe shall be in lengths, not less than 20 feet long, with plan ends beveled for welding. The size and wall thickness shall be as specified.

The interior and exterior of all casing pipe shall be cleaned, primed and lined with two coats of asphalt to achieve 0.05 inch minimum coating thickness, in accordance with AASHTO M190, Type A. All steel casing shall be butt-welded and all welds shall be full penetration single butt-welds in accordance with API Standard 1104.

2.5 Steel Valves:

A. General: All steel valves shall be new and manufactured to conform to ASTM A216, Grade WCB. All steel valves furnished shall be from the same manufacturer. All steel valves shall operate so that the valve will open when turning the operating nut in a counterclockwise direction. All steel valves buried underground shall have butt weld ends and be factory coated with 11 mils minimum thickness Scotchkote 306 by the 3M Company, Fostercoat, or approved equal. Each steel valve buried underground shall be installed with a high head extension, a non-rising stem with a two-inch (2") square shank adapter wrench nut and cast iron valve box. The extension shall bring the operating nut and sealant fittings to within 6" of the ground surface. The CONTRACTOR shall furnish

the OWNER with one (1) valve wrench to fit the operating nut furnished. All steel valves, for above ground installations, shall have raised face type flange ends and shall be installed with factory made locking devices. Suitable flanges for attaching above ground valves to pipe shall be furnished. Raised face flanged fittings shall be installed with a full face, neoprene-phenolic faced, type E gasket. The gasket shall fully seal the annual space between fitting faces to eliminate flange corrosion. Unless otherwise specified, all steel valves shall conform to ANSI Class 150 standards.

After installation, all valves will be furnished with the type and amount for the initial lubrication recommended by the manufacturer for natural gas service.

B. Valve Requirements:

1. 4" and Smaller Distribution System Steel Valves:. The 4" and smaller above ground steel valves shall be Rockwell Nordstrom carbon steel plug valves, or Kerotest gate valve model EV-11, wrench operated, or approved equal.

2. The 4" and smaller steel valves buried underground shall be Rockwell-Nordstrom carbon steel plug valves, figure 1925 ½, wrench operated, or Kerotest gate valves, Model M-1, wrench operated, or approved equal.

3. Six (6") and Eight (8") Inch Distribution System Steel Valves: The 6" and 8" above ground steel valves shall be Rockwell Dynamic Balance plug valves, figure 1945, wrench operated, or Kerotest gate valves, Model EV-11, wrench operated, or approved equal. The 6" and 8" steel valves buried underground shall be Rockwell Nordstrom plug valves, figure 4185 ½, wrench operated, or Kerotest gate valves, Model M-1, wrench operated, or approved equal.

4. Pressure Reducing Assemblies, Regulator Stations, Etc.: Valves for special assemblies shall be as specified and shall have a sufficient rating to withstand the maximum line and test pressures.

C. Valve Flanges: All companion flanges shall be raised face type. Companion flanges for ANSI Class 150 standard valves shall be forged steel slip-on or welding neck conforming to USAS 16.5.

2.6 Polyethylene (PE.) Valves:

A. General: All polyethylene (PE.) valves shall be manufactured to conform to ASTM D-2513 and D-1598. All PE. valves furnished shall be from the same manufacturer. All PE. valves shall operate so that the valve will open when turning the operating nut in a counterclockwise direction.

All PE. valves buried underground shall have a non-rising stem with built- in position indicator – standard 2" square adapter with deflector cone on top and a valve box made of cast iron collar and plastic bottom.

All PE. valves shall have 18" length pipe stub ends which can be butt heat-fused to the pipe or other fittings, and be wrench operated.

All PE. valves shall be made of cell classification PE. 355434C, SDR 11 material, and shall be designed for an allowable service pressure of 100 pounds per square inch in a Class 4 location.

B. Valve Requirements:

1. 2", 3", 4", 6" & 8" Size Distribution System PE. Valves: Distribution system PE. valves shall be Kerotest Ply Plug Valves, Rockwell Poly Valves, Figure No. 8311, or approved equal, for 2" size; Kerotest Poly Plug Valves, Rockwell Poly Valves, Figure No 83211, or approved equal, for 3" and 4" sizes; and Rockwell Poly Valves, Figure No. 83211, Kerotest Poly Plug Valve, or approved equal, for 6" and 8" sizes.

2. Pressure Reducing Assemblies, Regulator Stations, Etc: Valves for special assemblies shall be as specified.

2.7 Service Assemblies: Materials, to complete the various types of service assemblies shall meet the following SPECIFICATIONS:

A. Service Taps: Service taps on steel pipe distribution system mains shall be made using a Mueler Welding Inlet No-Blo valve tee #H-17650, Rockford Eclipse, or approved equal. Service taps on polyethylene pipe distribution system mains shall be made using appropriate sized service saddles and tapping tees, which conform to ASTM D2513, and which are made of cell classification PE. 355434C material. The service saddle and tapping tee shall be joined to the system main by heat fusion as specified in Paragraph 2.1.4(B) of these SPECIFICATIONS.

B. Protective Sleeves: All PE. service tap outlets will be fitted with the appropriate protective PE. sleeve to fit snugly over the pipe-fitting juncture and extend at least 12 inches over the pipe to limit pipe bending and exposure to mechanical damage at the joint.

C. Curb Stops: The curb stop shall be made using a 1" size PE. Kerotest Kerotite Service Valve, Part No. CS-1315, Rockwell Polyvalve, Figure No. 83211, plug valve, or approved equal, for 1" size service line. For 2", 3", and 4" size PE. service lines, the curb stop shall be made using the appropriate sized PE. valve as specified in paragraph 2.1.8(B) of these SPECIFICATIONS. For 1" size PE. service lines only, the curb stop shall have a minimum inside diameter of three inches (3"), and the remaining SPECIFICATIONS contained in paragraph 2.1.10 (B) shall apply.

The curb stop boxes shall be manufactured by Handley Industries, Inc., P. O. Box 863, Jackson, Michigan, Mueller Co., or approved equal.

D. Curb Stop Box: The curb stop box for 2", 3", and 4" size PE. service lines shall be manufactured the same as for a PE. valve box, as specified in paragraph 2.1.10 (B) of these SPECIFICATIONS. For 1" size PE. service lines only, the curb stop box shall have a minimum inside diameter of three inches (3"), and the remaining specifications contained in paragraph 2.1.10 (B) shall apply.

The curb stop boxes shall be manufactured by Handley Industries, Inc., P.O. Box 863, Jackson Michigan, Mueller Co., or approved equal.

E. Meter Stops: Meter stops furnished shall be from the same manufacturer and shall be of the permanently lubricated iron body type. Meter stops on all types of service pipe shall be Mueller No. H11175, galvanized finish, with lock wing, Rockford Eclipse, or approved equal.

F. Gas Service Meters: Meters for gas service shall be aluminum case, aluminum painted Rockwell, as specified below, shall have a standard direct reading meter index and shall be capable of accurately measuring 0.6 specific gravity natural gas with pressure losses and capacities as specified below. Capacities indicated are at four (4) ounce base. Prior to ordering any new meters, the CONTRACTOR shall ascertain from the Owner's Gas Superintendent the new meter numbers to be assigned to each new meter for stamping by the manufacturer.

PRESSURE LOSE	(SIZE SPUD)	CUBIC FEET/HOUR	
#275	½"	20 Lt.	275
#415	½"	20 Lt	415
#750	½"	45 Lt	750
#1,600	2"	45 Lt	1,600
Large Capacity	2"	2", 3" or 4"	3,000-10,000

All gas meters with capacities greater than 800 CFH shall be Dresser Root Rotary Meters.

G. Insulated Meter Swivels and Flanges: Insulated meter swivels and/or insulating flanges shall be installed as specified herein.

H. Meter Risers or Non-Corrodible Meter Risers: Meter risers or non-corrodible meter risers for PE. service pipe shall be joined to the type service pipe using the method described in paragraph 2.1.4 (B) of these SPECIFICATIONS for PE. pipe. Each meter riser shall be 24" long horizontally and 24" long vertically. Meter or non-corrodible meter risers shall have a 10" radius bend if PE. pipe and a (1) 90° ell if pipe and then be coated and wrapped as necessary to provide built-in cathodic protection at least one (1) foot below ground level and at least one (1) foot above ground level or to the bottom of the existing or new meter stop, regulator or meter fitting.

Meter or non-corrodible meter rise outlets shall be threaded with male I.P.S. threads to fit existing or new meter stop, regulator or meter fitting.

Pipe size of meter or non-corrodible meter risers shall be determined by I.P.S. of pipe required to fit to the existing or new meter stop, regulator or meter fitting.

I. Costumer Connections: The pipe size of adapter, coupling, fittings, etc., shall be determined by the I.P.S. of the pipe required to fit to the existing or new customer piping.

J. Fittings: The pipe size of the meter bars, meter stops, nipples, street ells, couplings, fittings, etc., shall be determined by the I.P.S. required to fit to the existing or new regulator and/or meter fittings.

K. Pressure Gauge: A pressure gauge shall be installed on certain service assembly set-ups as directed by the OWNER.

L. Protective Railings: Protective railing shall be installed for certain service assembly set-ups as directed by the OWNER.

2.8 Valve Boxes:

A. For Steel Pipe. Valve boxes for welded steel pipe mains shall be made of cast iron and shall be of the heavy roadway typed with an inside diameter of no less than 5 inches. The valve boxes shall be adjustable for elevation range of 24" to 36" and shall be of the three-piece screw type.

The top of the valve box shall be installed flush with the ground surface or street surface and shall be supported by a 24 inch diameter round or square concrete foundation.

The valve box shall be # H-10360, manufactured by Mueller Co., Decatur, Il. 62525, Handley Industries, Inc., or approved equal.

B. For Polyethylene Pipe. Valve boxes for polyethylene pipe mains shall be made of cast iron collar and plastic bottom and shall be of the heavy roadway type with an inside diameter of not less than 5 inches. The valve boxes shall be adjustable for elevation range of 24" to 36" and shall be of the three-piece slide type.

The top of the valve box shall be installed flush with the ground surface or street surface and shall be supported by a 24 inch diameter round or square concrete foundation.

The valve box cover shall be cast iron with the word "GAS" embossed on the topside and shall be of the bolt-down type. The valve box shall be manufactured by Handley Industries, Inc., P. O. Box 863, Jackson, Michigan 49204, Mueller Co., or approved equal.

2.9 Pipe Line Crossing Marker Signs: Pipe line crossing marker signs shall be fabricated and installed by the CONTRACTOR in close proximity to all casing vents, canal or bayou crossings, field crossings, public road crossings, railroad crossings, and other locations as directed by the ENGINEER. Each crossing shall be provided with two (2) signs each.

Pipe line crossing marker signs shall be mounted on rigid flanged, vinyl coated channel type steel posts with drilled or punched 3/8" diameter holes centered at 1" intervals along its entire length. The vinyl coating shall be impregnated with high intensity yellow color and ultraviolet inhibitors to resist fading. The posts shall be 7 feet long, 2" wide channel type steel post with 2.5 feet minimum embedment, and weight 2.5 pounds per linear foot. The post shall be as distributed by Phillips Engineering Company, Inc., Clearwater, Florida (1-831- 461-7711), Handley Industries, Inc. or approved equal.

Pipeline crossing marker signs shall be constructed of 0.090" thick fiberglass sheeting, 8" width x 12" height. The signs shall have a yellow and black lettering. The sign shall be secured to the post with ¼" x 2" length round head steel stove bolts, washers and nuts. The signs shall be as distributed by Phillips Engineering Co., Inc., Clearwater, Florida (1-800-237-9861), Handley Industries, Inc., or approved equal.

2.10 Non-Corrosive Metallic Wire Over PE. Gas Pipe: Non-corrosive metallic wire shall be installed directly over and on the center of all PE. gas mains and service lines for detection purposes. This wire shall be continuous on all PE. mains and service lines and shall be connected to all fixtures, appurtenances and pipe.

The non-corrosive metallic wire shall be Type TW, A.W.F. #10 gauge, insulated, stranded copper wire. Wire splices shall be made using splice kits similar or equal to Model DBR by 3M.

No special payment shall be made for installation of the wire. The cost of such shall be included in the unit price bid for gas pipe.

2.11 Corrosion Protection. When directed, the CONTRACTOR shall provide adequate cathodic protection to protect the facilities against corrosion. The CONTRACTOR shall furnish all items for the cathodic protection. The price for cathodic protection shall be included in other items of WORK. The cathodic protection shall have design life of 20 years and be installed in accordance with the National Association of Corrosion Engineers (NACE) Publication RP-01-69. The following minimum SPECIFICATIONS shall apply:

A. Anodes and Leads: Each location where cathodic protection is to be installed shall be provided with a seventeen (17) pound packaged magnesium anode with a high efficiency backfill material for its cathodic protection. The anode and backfill material is to be manufactured by Allied Corrosion Industries, Inc., 6180 Atlantic Blvd., Suite O, Norcross, Georgia 30071, Telephone No. 1-800-241-0809; Harco Corporation, or approved equal.

Each anode shall be provided with a minimum 2 foot long, unspliced, Type TW insulated, A.W.G. #10 gauge solid copper connecting wire (lead). Each connecting wire shall be factory installed with the place of emergence from the anode in a cavity sealed flush with a dielectric sealing compound.

B. Lead Bonding: Connection of the anode lead to the facilities shall be by use thermal welding equal to Calweld process. After the connection has been made, inspected and approved, the damaged area of the facilities and the metal portion of the connection shall be thoroughly coated as specified by NACE Specifications RP-01-75.

2.12 Service Line Insertions: The CONTRACTOR shall insert new PE. service line into existing steel service line. All new service line insertions shall be 0.090" wall copper tubing size (CTS) PE. gas service line.

All service line insertions shall maintain an annular space clearance of 10% between the outside diameter (O.D.) of the new service line inserted and the existing service line inside diameter (I.D.). The size of new service line inserted shall be as follows:

Existing Steel Service Line	New Service Line Insertion (O.D.)
2"	1 ¼"
1 ½"	1"
1"	¾"

Each service line insertion shall be provided with appropriate fittings to allow for meter reconnections to main with and/or without meter relocation.

2.13 Concrete: Refer to Section 07330 – Cast-In-Place Concrete.

2.14 Painting: All steel pipe, valves, and equipment (Including service assemblies, protective railings, pressure reducing assemblies, meter/regulator stations, etc.) installed above ground shall be painted with an aluminum finish paint as manufactured by Pratt-Lambert, Tnemec, or approved equal, as follows:

Manufacturer:	Pratt-Lambert	Tnemec
Preparation:	SSPC-SP 1 & 2	Solvent & Hand tool Cleaning
First Coat:	Zinc Chromate Primer	77
Second Coat:	Aluminum Enamel	Aluminum Enamel

PART 3 - EXECUTION

3.1 General: All pipes, valves, appurtenances and accessories shall be installed as directed. Any deviations must be approved by the ENGINEER before installation.

3.2 Welding Procedures, Procedure Qualification and Welder Qualification: See Attachment "B" and "C".

3.3 Pipe Bedding Conditions: Refer to Section 07150 – Excavation, Backfill and compaction of Utility Trenches.

3.4 Inspection of Pipe Before Installation: All pipe, fittings and specials shall be carefully inspected in the field before lowering in the trench. Cracked, broken, warped, out of round or otherwise defective pipe, fittings, or determined by the CONTRACTOR or the ENGINEER, shall be pulled and not installed. Such rejected pipe shall be clearly tagged in such manner as not to deface or damage it, and the pipe shall then be removed from the job site by the CONTRACTOR at his own expense.

3.5 Pipe Laying:

A. Every precaution shall be taken to prevent foreign material from entering gas pipe while it is being placed in the trench. At times when pipe laying is not in progress, the open ends of the pipe shall be closed by a water tight plug or other means approved by the ENGINEER. If water is in the trench, the seal shall remain in place until the trench is pumped enough to resume laying operations. No pipe shall be laid in water or when, in the opinion of the ENGINEER, trench conditions are unsuitable.

B. The CONTRACTOR will be required to install butt fusion, temporary caps on the ends of all mains and service lines at the end of laying operations.

3.6 Installation of Non-Corrosive Metallic Locator Wire: The CONTRACTOR shall install a non-corrosive metallic wire directly over and on the center of all PE gas mains and service lines. The wire shall be continuous on all PE mains and service lines and wire shall also be taped to the pipe fittings and valve settings in a neat manner. The locator wire shall be taped to the pipe at ten (10') feet intervals to insure a secure juxtaposition of the wire over the pipe for assistance in future identification of it.

3.7 Installation of Wire Splice Kits: Locator wire shall result in a continuous conductor using splices made with Direct Bury Splice kits.

3.8 Location of Existing Gas Systems:

A. General: The attention of the CONTRACTOR is directed to the fact that existing gas mains or service lines may have to be tapped, cut, "killed", relocated, tied together and otherwise adjusted to completely perform all required work. The CONTRACTOR shall not be permitted to indiscriminately shut off service. The CONTRACTOR shall cooperate with the Owner in order that lack of service will be reduced to a minimum. The CONTRACTOR shall arrange with representatives of the Owner and the ENGINEERS for a mutually acceptable time when service can be discontinued in the various sections of the system.

The CONTRACTOR shall place a "Gas Cut-Off Notice", furnished by the Owner, on the door of any customer whose gas service is interrupted.

The general location, size and type of existing utilities have been taken from existing maps and/or surveys. The size of pipe indicated is the nominal diameter and the CONTRACTOR shall be responsible for obtaining the correct outside diameter of the pipe before ordering any valves, fittings, tapping sleeves, etc., to assure a proper fit.

B. Location of Existing Utilities: The approximate location of known existing utilities have not be verified and the final location of all tie-ins, taps, etc. shall be approved by the ENGINEER. The CONTRACTOR shall be responsible for physically locating all existing pipe and appurtenances. No additional compensation shall be paid for such WORK, but shall be included in the unit price bed per foot of pipe.

3.9 Installing Steel Pipe: All steel gas pipe installations shall be made in accordance with USAS B31.8-841.2, "American Standard Code for Pressure Piping". "Installation of Steel Pipe lines and Mains", except as amended by these SPECIFICATIONS.

The CONTRACTOR shall protect all coated pipe from exposure to the weather prior to backfilling. Coated pipe shall be handled at all times with equipment designed to prevent damage to the coating. The CONTRACTOR shall not string pipe in excess of the amount, which, in the opinion of the ENGINEER, may not be installed within 7 days.

The use of pinch bars, chain slings, or other pipe handling equipment found to be injurious to the coating will not be allowed. Sections of coated pipe being tied into the line shall not be dragged or pulled into position, and the length of such sections shall be regulated to allow their handling without damage to the coating. At stream crossings, or at any other locations where it may be necessary to pull, drag, or jack and bore sections of pipe into place, the coated pipe shall be protected as directed by the ENGINEER. "Type 1 Standard Pipe Foundation" shall be used for the installation of all steel gas mains.

3.10 Welding and Field Coating Procedure for Steel Pipe: Welding shall be in accordance with USAS B31.8, API Standard 1104, and ASME Section IX, except as modified herein.

A. Welding Process: Prior to performing any welding, the CONTRACTOR'S welding procedure SPECIFICATIONS shall be presented in writing and qualified to demonstrate that suitable sound welds can be made by each procedure required. The quality of each

weld at every joint shall be determined by mechanical or radiographic testing, as appropriate.

Certification of each acceptable written procedure and performance qualification test shall be made by a qualified testing laboratory and the results recorded. Evidence of recent experience making acceptable hot taps (taps on a pipe line under pressure) is also required.

The CONTRACTOR shall bear all of the costs associated with qualifying each welding procedure specification, performing each procedure qualification test, recording of the welding data and test results, certifications and retests and renewal of qualifications.

The CONTRACTOR shall furnish the necessary equipment and personnel to cut out and test welds. For such tests, the entire weld shall be cut from the line, cutting the pipe 4" back on each side of the weld. Coupons cut from this weld shall be tested for tensile strength, ductility and penetration.

Where welds are cut for testing, the line shall be tied back together with either a single weld, or by use of a piece of new pipe not less than 2 feet in length. The entire cost of testing such welds and repairing the line where they were cut out to be borne by the CONTRACTOR.

Pipe shall be butt-welded to develop a joint that will result in complete fusion throughout the entire wall thickness of the pipe. The welded joint shall satisfactorily hold any pressure that the line will be subjected to in testing or during operation at maximum design pressure. At no time shall the pipe be rolled or turned during welding. Any defective joints resulting from poor welding technique, overlaps, under-cuts, convexity, or any other reason shall be cut out and replaced with a satisfactory joint.

Mitre joints shall be limited to pipe connections where commercially fabricated welding fittings cannot be used, and then shall be made in segments limiting the deflection in each section to angles agreed upon by the ENGINEER.

Where welding fittings are required, the welding fittings shall be commercially fabricated ASTM A234 steel fittings of pressure rating equal to or greater than ANSI Class 150 Standards. All bends shall be long radius type. Where reduction of size in pipes occurs swage fittings shall be used. Ninety degree saddle welding one pipe into another will not be permitted, except in special cases when prior approval of the ENGINEER has been obtained.

Each welder shall be furnished a stencil, a record being kept thereof, and each welder shall stencil all welds made by him. The CONTRACTOR shall furnish and use only such types and sizes of welding rods as are approved by the ENGINEER.

B. Equipment: All pipe shall be electric welded by the "shielded Metal-Arch" process. Welding machines and appurtenances thereto shall be of size and type suitable for the work, and shall be maintained in such conditions as to insure acceptable welds, continuity of operation, and safety of personnel.

Welding machines shall be direct current and shall have reversed polarity, work negative and electrode positive, and shall be operated within the amperage and voltage ranges recommended for each size and type of electrode.

C. Materials: The filler metal for the shielded metal arc process shall be according to API Standard 1104 and shall be 5/32 inch or 3/16 inch in size.

D. Procedure Details: Surfaces to be welded shall be free from loose scale, slag, heavy rust, grease, paint, cement and other foreign material except tightly adherent mill scale.

A light film of linseed oil primer or spatter film compound may be disregarded. Joint surfaces shall be smooth, uniform and free from fins, tears and other defects, which adversely affect proper welding.

The number of filler beads should be such that the completed weld will have a reinforcement of not less than 1/32 inch and not more than 1/16 inch. After the root bead has been completed, the second and third beads shall be added immediately. There shall be not less than three beads.

Two beads shall not be started at the same location. The surface pass shall be substantially central to the seam and all surface passes shall be reasonable smooth and free from depressions. The face of the completed weld should be approximately 1/8-inch greater than the width of the original groove.

The completed weld shall be thoroughly brushed and cleaned. Peening of weld layers or passes may be used to prevent undue distortion. Surface layers and the first pass in groove welds shall not be peened. Peening, when required, shall be performed with light blows of a hammer, using a blunt nosed tool. Any chipping at the root of welds and chipping of welds to remove defects shall be performed with a round nosed tool or by gas gouging.

All field welds and test coupons must be clearly marked by stencils to identify the welder and the tests for which the coupons are intended. The CONTRACTOR shall keep a record of all symbols and numbers. All welds must present a neat and clean appearance free of cracks, inadequate penetration, burn through or other obvious defects. Undercutting adjacent to the final bead shall not exceed 1/32 inch.

Coupons for all tests may be flame cut from the weld, but all necessary notching and machining of coupons shall be done in the testing laboratory.

The use of water for quenching any weld is prohibited.

The CONTRACTOR shall, at his expense, cut welds from the line, as directed by the ENGINEER, for the purpose of testing. After welds are removed from the line, coupons will be cut around the circumference of the pipe and tested as outlined in paragraph 3.10.A above. The CONTRACTOR shall bear the cost of replacing defective welds discovered by test or radiographic inspection.

E. Field Coating of Welded Joints and Repair of Damaged Coating Areas: The field coating procedure for welded steel pipe, fittings, associated appurtenances, and joints installed underground shall be the procedure contained in NAPCA Bulletin 6-69-90-5, and any subsequent revisions thereto, using heat shrinkable materials, such as 3M "Scotchkote" Brand 206P hot melt patch compounds, or Raychem WPCT Thermofit, or approved equal; or a cold-applied coating in 3" wide tapeform, such as Tapecoat CT, manufactured by the Tapecoat Company, Evanston, Illinois 60204, Grace Servi-Wrap, or approved equal; or the

following:

1. The pipe and weld shall be cleaned of any scale, dirt or foreign matter. All charred and damaged coating areas shall be abraded by hand filing or use of carborundum cloth.
2. A two part, 100% solids, liquid epoxy compound specified by the manufacturer of the coating material shall be applied to the abraded areas. Application shall be made to a minimum thickness of 25 mils and shall overlap undamaged area a minimum of 0.5 inches.
3. The liquid patch compounds shall not be applied when the pipe temperature is below 50°F unless provisions are made for heat curing the patch material using methods and temperatures in accordance with the procedures recommended by the coating manufacturer.
4. The CONTRACTOR shall furnish low-pulse electronic Holiday Detectors of a type approved by the ENGINEER, and shall check all coating applications with the detector prior to lowering pipe into the trench. All holidays found shall be repaired and such repairs shall again be tested with the detector to make sure the repairs are effective.

   The ENGINEER, at his discretion, will inspect both visually and with a Holiday Detector, the coating and repair areas. Any coating showing defects of "Holidays" shall be repaired according to the foregoing SPECIFICATIONS for repairing damaged coating areas.

3.11 Installing P.E. Pipe: All P.E. gas mains shall be installed in strict accordance with the manufacturer's recommendation.

The manufacturer of the type of pipe furnished shall furnish a qualified factory representative for a minimum of three full working days to train, observe and qualify the CONTRACTOR'S personnel on the proper method of joining and installing every size of pipe and the associated fittings to be used on the job in accordance with applicable Department of Transportation (DOT) regulations.

The CONTRACTOR and the factory representative shall coordinate these days in order to assure that the representative is on the job at the start of the laying of each different size pipe by the CONTRACTOR.

On P.E. service lines and mains, each valve will be supported by an 80-pound bag of "Sackrete" concrete mix.

Heat fused PE. pipe shall be snaked in the trench. Backfill shall not be placed on any plastic pipe while it is in a heated condition. Cooling of the pipe by an approved method will be required by the ENGINEER, if necessary.

Set time for newly assembled heat fused joints shall be as follows:

10	Minutes minimum	@	60°F to 90°F
11	Minutes minimum	@	40°F to 60°F
12	Minutes minimum	@	25°F to 40°F

3.12 Field Cutting if Pipe: Field cutting of all pipes shall be accomplished by a method approved by the ENGINEER. Any section of pipe, which is damaged during the cutting cooperation, will be rejected.

3.13 Setting of Valves and Fittings: Settings of valves and fittings shall be in accordance with USAS B31.8, except as modified for PE pipe in Paragraph 3.11 of these SPECIFICATIONS.

3.14 Installing Service Assemblies: All essential details of construction of the service assemblies to be installed are specified herein; these SPECIFICATIONS shall be followed carefully. The labor, materials and equipment required to be furnished by the CONTRACTOR for each service assembly shall depend on the installation size, type and meter setting.

The CONTRACTOR shall set each service assembly as directed by the ENGINEER. The existing meter and/or regulator in the proposed service assembly may or may not be refitted and used at the relocation point as directed by the ENGINEER.

Existing meters and regulators, not to be refitted, used again or relocated, shall be delivered to the City of Alexandria Gas Department, accompanied by a "Gas Service Ticket", furnished by the CONTRACTOR, detailing the location from which it was removed, old meter number, new meter number, etc. All existing gas service lines, which are not to be re-used, shall be cut and capped below natural ground surface.

The CONTRACTOR shall not set the service assemblies until all the mains have been cleaned, tested, purged and approved by the ENGINEER.

A. Service Assembly Type I: Service Assembly Type l as detailed on the PLANS shall be for those instances where an existing service assembly with a 275, 415, 750 and/or 1600 cubic feet per hour (CFH) meter setting is to be refitted, relocated, and/or replaced.

The CONTRACTOR shall disconnect and dismantle the existing service assembly. The CONTRACTOR shall furnish the materials; install the Owner's existing or new meter, regulator, and service assembly.

Prior to ordering new meters, the CONTRACTOR shall ascertain from the City of Alexandria Gas Superintendent the new meter numbers to be assigned to each new meter for stamping by the manufacturer.

The Scope of Work for "Service Assembly Type l" shall include all the necessary labor, materials and equipment, field taps, tapping tees, saddles, curb stops, curb stop boxes, riser, regulator, or other incidental devices required to connect the service line to the distribution main; disconnect, refit and/or relocate, reassemble and connect the service assembly to the service line; and connect the customer's piping to the service line. All new service line required to complete the installation shall be paid for separately. Should a new meter be required, the new meter shall be measured the number of meters required and shall be included in the pay items for Gas Service Meters.

B. Service Assembly Type II. Service assembly Type II shall be for those instances where no service assembly exists.

The CONTRACTOR shall furnish and install the components, fittings, etc. for the size and type of service assembly set up.

The Scope of Work for "Service Assembly Type II" shall include all the necessary labor, materials and equipment, field taps, tapping tees, saddlers, curb stops, curb stop boxes, or other incidental devices required to connect the service line to the distribution main; and to connect the service assembly set-up to the service line. All service line required to complete the installation shall be paid for separately.

C. Gas Meters: Where required, new gas meters shall be furnished and installed in accordance with these SPECIFICATIONS. New gas meters shall be measured by the type and number furnished and installed. The meters shall be installed with the Service Assemblies which shall be paid separately.

3.15 Hot Tap Connections of Mains: All gas main hot tap connections shall be for those instances where said gas mains to be tapped and/or connected are active and under existing gas system pressure. The CONTRACATOR shall furnish the labor, materials (Such as all PE. and steel fittings, transition fittings, weld caps, stopple fittings, three way tees, etc.) and equipment required for each hot tap connection.

3.16 Installing Casing Pipe: The CONTRACTOR shall furnish and install all utility mains perpendicular to and under railroad tracks and roadways in a casing pipe. This casing shall be complete with end seals, vent pipe, and other specials required to install the main in the casing. All installations shall be in accordance with these SPECIFICATIONS and the requirements of the railroad or roadway, as applicable.

3.17 Field Cleaning, Testing and Purging: The field cleaning, testing and purging operations shall be applied to the whole or individual valved- off sections of the high pressure distribution mains (feeder mains), distribution mains and service lines either before or after the trench is backfilled, as directed by the ENGINEER.

The CONTRACTOR shall furnish the equipment, gauges, meter, gas and other material, tools, labor and other necessary assistance for conducting the field cleaning, testing and purging operations.

The ENGINEER shall be notified at least 48 hours in advance of the field cleaning, testing and purging operations. The cleaning, testing and purging of all lines shall conform to the requirements of USAS B31.8, except as modified below:

A. Cleaning: Prior to conducting the pressure tests, all gas mains, service assemblies, fittings and/or service lines to be connected thereto shall be blown clear by the use of compressed air and this cleaning operation shall continue until these lines and/or fittings are cleared to the satisfaction of the ENGINEER.

At no time will compressed air be used without a dehumidifier. The lines shall then be pigged with approved foam pigs to demonstrate unrestricted clearance of all 2" size and larger mains.

B. Testing: All gas mains, services and service assemblies shall be tested as follows:

1. Distribution System Mains and Service Lines:
   a. Gas mains larger than 1" IPS Diameter — 100 psi for 24 hours with no pressure loss.

b. Piping from the gas main including the service line to the valve on the upstream side of the service assembly, 100 psi for 24 hours with no pressure loss.

c. High pressure gas main (i.e. greater than 100 psi) or upstream piping (i.e. transmission type) shall be tested at 1.5 times the design maximum allowable operation pressure (MAOP).

2. Any leak developing during any test shall be repaired, the lines and/or fittings made tight and the test repeated until successful.

1. All tests on the gas mains larger than 1" IPS diameter and the service line from the gas main to the valve on the upstream side of the service assembly shall be recorded by a pressure recorder with 10 inch dial and 24 hour charts which will clearly indicate a differential on one (1) pound.

C. Purging: Prior to delivery of natural gas to the system, all gas mains service lines, service assemblies and/or the associated fittings shall purged with natural gas. This is to be performed through the use of the Owner's Gas paid for by the CONTRACTOR in a manner of procedure approved by the City of Alexandria Gas Department and the ENGINEER

At no time shall any valve in the system be subjected to gas pressure one side and air pressure on the other. Blind flanges shall be used prevent this condition from occurring.

When gas is delivered to the system, all fittings shall be checked for tightness with a soap-water solution. No gas leaks will be allowed.

Results of the tightness tests shall be recorded and a copy given to the ENGINEER.

Should the amount of leakage exceed that specified, the CONTRACTOR shall, at his expense, locate and repair the defective joints until the leakage is within the specified limits.

The cost for field cleaning, testing and purging shall be included in the unit price bid per foot of pipe.

3.18 Witnessing Of Tests: The cost of witnessing a test by the ENGINEER shall be borne by the Owner one time. The cost of witnessing re-tests of sections which fail the initial test will be deducted from CONTRACTOR payments for compensation of the ENGINEER.

3.19 Gas Service Interruptions: WORK shall be performed such that gas service will not be interrupted, if possible, throughout this contract. Whenever becomes necessary to "Kill" a section of line, the CONTRACTOR shall cooperate fully with the City of Alexandria Gas Department Personnel.

The CONTRACTOR shall be responsible for checking each house, store building, etc. in advance to insure that its owner or occupant is or will be available during anticipated gas service interruptions.

Prior to refitting and/or relocating the existing service assembly and connecting the service lines to said service assembly and the customer's piping, the CONTRACTOR shall turn off all pilot

lights served by said service assembly.

After the customer's piping has been reconnected, the CONTRACTOR is responsible for determining that it is safe to turn on the gas, and re-lighting all pilot lights served by said service assembly.

The CONTRACTOR shall be responsible for coordinating his work with the City of Alexandria Gas Department personnel. Under no circumstances will the CONTRACTOR turn on the gas to a customer's piping until the CONTRACTOR has determined that it is safe to do so and without the full knowledge of the City of Alexandria Gas Department personnel. The CONTRACTOR shall align his WORK schedule to accommodate the City of Alexandria Gas Department.

3.20 Gas System Switchover: CONTRACTOR shall schedule his work such that the switchover from the existing system to the new system shall be at minimum inconvenience to the Owner and its customers. At no time will a new gas main be connected to existing customer until it has been tested and accepted by the Owner and the ENGINEER. Should the CONTRACTOR elect to connect customers to portions of the new system prior to completion of entire system, such connections shall not relieve him of the responsibility of completing his contract as required by the SPECIFICATIONS. Portions so connected or turned over to the Owner will not relieve the CONTRACTOR of his responsibilities under the contract until the entire project is completed, tested and accepted.

3.21 Purging, Flooding and Abandonment of Existing Gas Lines: At that time when all services have been transferred to the new main and all interconnections have been completed, the existing main to be abandoned shall be disconnected from the main feed point and gas purged from the line by flooding and filling with water. When all flooding is complete, the line shall be tightly capped.

3.22 Records: CONTRACTOR to complete "Utility Valve Record" and "Utility Pipe Data Sheet" for all valves and pipe. Forms are attached to this Section. (Attachments "F" and "G", respectfully)

3.23 Boring and Jacking: Refer to Section 07170 – Boring and Jacking – Casing, Pipe and Service Tubing.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Gas Pipe:

A. Measurement: Gas pipe, placed and accepted, will be paid for at the contract unit price per linear foot for gas pipe of the various sizes, types and classifications, which price and payment shall constitute full compensation for furnishing, hauling, installing complete, testing the pipe; for excavation, preparation of bed and backfilling, compaction and removing surplus earth; removing and replacing culvert pipe; transitional fittings; and for the furnishing of all equipment, tools, labor and incidentals necessary to complete the item in accordance with SPECIFICATIONS.

B. Payment: Payment, measured as provided above, including all work labor, materials, tools, equipment and incidentals required to complete the work as specified herein and/or as directed by the ENGINEER, will be paid a the Contract price for Linear Foot.

C. Pay Items:

PE Gas Main (3/4") (06110)(01) per Linear Foot

PE Gas Main (1") (06110)(02) per Linear Foot

PE Gas Main (1 1/2") (06110)(03) per Linear Foot

PE Gas Main (2") (06110)(04) per Linear Foot

PE Gas Main (3") (06110)(05) per Linear Foot

PE Gas Main (4") (06110)(06) per Linear Foot

PE Gas Main (6") (06110)(07) per Linear Foot

PE Gas Main (8") (06110)(08) per Linear Foot

Steel Gas Main (3/4") (06110)(09) per Linear Foot

Steel Gas Main (1") (06110)(10) per Linear Foot

Steel Gas Main (1 1/2") (06110)(11) per Linear Foot

Steel Gas Main (2") (06110)(12) per Linear Foot

Steel Gas Main (3") (06110)(13) per Linear Foot

Steel Gas Main (4") (06110)(14) per Linear Foot

Steel Gas Main (6") (06110)(15) per Linear Foot

Steel Gas Main (8") (06110)(16) per Linear Foot

4.2 Steel Pipe Fittings:

A. Measurement: Steel pipe fittings, placed and accepted, measured as provided above, will be paid for at the contract unit price per each for steel pipe fittings, which price and payment shall constitute full compensation for furnishing, hauling, installing complete, testing; for excavation, preparation of bed and backfilling; concrete thrust blocks or anchors; and for the furnishing of all equipment, tools, labor and incidentals necessary to complete the item in accordance with SPECIFICATIONS.

B. Payment: Payment, measured as provided above, including all work labor, materials, tools, equipment and incidentals required to complete the work as specified herein and/or as directed by the ENGINEER, will be paid a the Contract price for Each.

C. Pay Items:

Steel Gas Main 90 Deg. Bends (1") (06110)(17) per Each

Steel Gas Main 90 Deg. Bends (1 1/2") (06110)(18) per Each

Steel Gas Main 90 Deg. Bends (2") (06110)(19) per Each

Steel Gas Main 90 Deg. Bends (3") (06110)(20) per Each

Steel Gas Main 90 Deg. Bends (4") (06110)(21) per Each

Steel Gas Main 90 Deg. Bends (6") (06110)(22) per Each

Steel Gas Main 90 Deg. Bends (8") (061100)(23) per Each

Steel Gas Tees (1" to 1") (06110)(24) per Each

Steel Gas Tees (1 1/2" to 1") (061100)(25) per Each

Steel Gas Tees (1 1/2" to 1 1/2") (06110)(26) per Each

Steel Gas Tees (2" to 1") (06110)(27) per Each

Steel Gas Tees (2" to 1 1/2") (061100)(28) per Each

Steel Gas Tees (2" to 2") (06110)(29) per Each

Steel Gas Tees (3" to 1") (06110)(30) per Each

Steel Gas Tees (3" to 1 1/2") (06110)(31) per Each

Steel Gas Tees (3" to 2") (06110)(32) per Each

Steel Gas Tees (3" to 3") (06110)(33) per Each

Steel Gas Tees (4" to 1") (06110)(34) per Each

Steel Gas Tees (4" to 1 1/2") (06110)(35) per Each

Steel Gas Tees (4" to 2") (06110)(36) per Each

Steel Gas Tees (4" to 3") (06110)(37) per Each

Steel Gas Tees (4" to 4") (06110)(38) per Each

Steel Gas Tees (6" to 1") (06110)(39) per Each

Steel Gas Tees (6" to1 1/2") (06110)(40) per Each

Steel Gas Tees (6" to 2") (061100)(41) per Each

Steel Gas Tees (6" to 3") (061100)(42) per Each

Steel Gas Tees (6" to 4") (06110)(43) per Each

Steel Gas Tees (6" to 6") (061100)(44) per Each

Steel Gas Tees (8" to 1") (06110)(45) per Each

Steel Gas Tees (8" to1 1/2") (06110)(46) per Each

Steel Gas Tees (8" to 2") (061100)(47) per Each

Steel Gas Tees (8" to 3") (06110)(48) per Each

Steel Gas Tees (8" to 4") (06110)(49) per Each

Steel Gas Tees (8" to 6") (06110)(50) per Each

Steel Gas Tees (8" to 8") (06110)(51) per Each

1" Stopple Fitting (06110)(52) per Each

1 1/2" Stopple Fitting (06110)(53) per Each

2" Stopple Fitting (06110)(54) per Each

3" Stopple Fitting (06110)(55) per Each

4" Stopple Fitting (06110)(56) per Each

6" Stopple Fitting (06110)(57) per Each

8" Stopple Fitting (06110)(58) per Each

1" Three Way Tapping Tee (06110)(59) per Each

1 1/2" Three Way Tapping Tee (06110)(60) per Each

2" Three Way Tapping Tee (06110)(61) per Each

3" Three Way Tapping Tee (06110)(62) per Each

4" Three Way Tapping Tee (06110)(63) per Each

6" Three Way Tapping Tee (06110)(64) per Each

8" Three Way Tapping Tee (06110)(65) per Each

1" PE to Steel Transition Fitting (06110)(66) per Each

1 1/2" PE to Steel Transition Fitting (06110)(67) per Each

2" PE to Steel Transition Fitting (06110)(68) per Each

3" PE to Steel Transition Fitting (06110)(69) per Each

4" PE to Steel Transition Fitting (06110)(70) per Each

6" PE to Steel Transition Fitting (061100)(71) per Each

8" PE to Steel Transition Fitting (06110)(72) per Each

1" Stopple Fitting for PE to Steel Gas Main (06110)(73) per Each

1 1/2" Stopple Fitting for PE to Steel Gas Main (06110)(74) per Each

2" Stopple Fitting for PE to Steel Gas Main (061100)(75) per Each

3" Stopple Fitting for PE to Steel Gas Main (06110)(76) per Each

4" Stopple Fitting for PE to Steel Gas Main (06110)(77) per Each

6" Stopple Fitting for PE to Steel Gas Main (06110)(78) per Each

8" Stopple Fitting for PE to Steel Gas Main (06110)(79) per Each

4.3 Valves and Valve Boxes:

A. Measurement: The number of valves or valves with valve boxes together, as a unit, installed and accepted, will be paid for at the contract unit price per each, which price and payment shall constitute full compensation for furnishing, hauling, installing complete and testing; for excavation and native backfilling; and for the furnishing of all equipment, tools, labor and incidentals necessary to complete the item.

B. Payment: Payment, measured as provided above, including all work labor, materials, tools, equipment and incidentals required to complete the work as specified herein and/or as directed by the ENGINEER, will be paid a the Contract price for Each

C. Pay Items:

Steel Gas Valves and Valve Box Assembly (1") (06110)(80) per Each

Steel Gas Valves and Valve Box Assembly (1 1/2") (061100)(81) per Each

Steel Gas Valves and Valve Box Assembly (2") (06110)(82) per Each

Steel Gas Valves and Valve Box Assembly (3") (06110)(83) per Each

Steel Gas Valves and Valve Box Assembly (4") (06110)(84) per Each

Steel Gas Valves and Valve Box Assembly (6") (06110)(85) per Each

Steel Gas Valves and Valve Box Assembly (8") (06110)(86) per Each

PE Gas Valves and Valve Box Assembly (1") (06110)(87) per Each

PE Gas Valves and Valve Box Assembly (1 1/2") (06110)(88) per Each

PE Gas Valves and Valve Box Assembly (2") (06110)(89) per Each

PE Gas Valves and Valve Box Assembly (3") (06110)(90) per Each

PE Gas Valves and Valve Box Assembly (4") (06110)(91) per Each

PE Gas Valves and Valve Box Assembly (6") (061100)(92) per Each

PE Gas Valves and Valve Box Assembly (8") (06110)(93) per Each

4.4 Gas Service Assemblies:

A. Measurement: Gas service assemblies, in place and accepted, will be paid for at the contract unit price per each, which price and payment shall constitute full compensation for furnishing, hauling, and installing all material complete; for all excavation and native backfilling; for all equipment, tools, taps, labor and incidentals necessary to complete the item.

B. Payment: Payment, measured as provided above, including all work labor, materials, tools, equipment and incidentals required to complete the work as specified herein and/or as directed by the ENGINEER, will be paid a the Contract price for Each.

C. Pay Items:

Gas Service Assemblies (Type 1) (3/4") (06110)(94) per Each

Gas Service Assemblies (Type 2) (3/4") (06110)(95) per Each

Gas Service Assemblies (Type 1) (1") (06110)(96) per Each

Gas Service Assemblies (Type 2) (1") (061100)(97) per Each

Gas Service Assemblies (Type 1) (1 1/2") (06110)(98) per Each

Gas Service Assemblies (Type 2) (1 1/2") (061100)(99) per Each

Gas Service Assemblies (Type 1) (2") (06110)(100) per Each

Gas Service Assemblies (Type 2) (2") (06110)(101) per Each

Gas Service Assemblies (Type 2) (Riser Only) (06110)(102) per Each

4.5 Gas Service Meters:

A. Measurement: Gas Service Meters, installed and accepted, will be paid for at the contract unit price per each, which price and payment shall constitute full compensation for furnishing, hauling, installing complete, including furnishing connectors, couplings, and testing in accordance with the SPECIFICATIONS.

B. Payment: Payment, measured as provided above, including all work labor, materials, tools, equipment and incidentals required to complete the work as specified herein and/or as directed by the ENGINEER, will be paid a the Contract price for Each.

C. Pay Items:

Gas Service Meters (275) (06110)(103) per Each

Gas Service Meters (415) (06110)(104) per Each

Gas Service Meters (750) (061100)(105) per Each

Gas Service Meters (1600) (06110)(106) per Each

1" Gas Piping for Meter Relocation at Building, Including all Appurtenances Required for Gas Meter Relocation and Tie-In to Existing House Piping (06110)(107) per Each

1 1/4" Gas Piping for Meter Relocation at Building, Including all Appurtenances Required for Gas Meter Relocation and Tie-In to Existing House Piping (06110)(108) per Each

1 1/2" Gas Piping for Meter Relocation at Building, Including all Appurtenances Required for Gas Meter Relocation and Tie-In to Existing House Piping (06110)(109) per Each

4.6 PE Casing Crossing:

A. Measurement: PE casing crossings, of the various sizes, including all items indicated and included within the City of Alexandria Standard Detail "Gas Main Casing Crossing" and including excavation and native backfill, new locator wire, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured by the Linear Foot installed, tested and accepted.

B. Payment: PE casing crossings, measured as provided above, will be paid at the Contract unit price per Linear Foot for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere)(Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere) (Pavement Repair or Replacement Paid Elsewhere)(Select Backfill Paid Elsewhere)(Traffic Control Paid Elsewhere)

C. Pay Items:

2" PE Casing Crossing (6" Casing With all Items Indicated and Included within the City of Alexandria Standard Detail "Gas Main Casing Crossing" (06110)(110) per Linear Foot

4" PE Casing Crossing (8" Casing With all Items Indicated and Included within the City of Alexandria Standard Detail "Gas Main Casing Crossing" (06110)(111) per Linear Foot

6" PE Casing Crossing (10" Casing With all Items Indicated and Included within the City of Alexandria Standard Detail "Gas Main Casing Crossing" (06110)(112) per Linear Foot

8" PE Casing Crossing (12" Casing With all Items Indicated and Included within the City of Alexandria Standard Detail "Gas Main Casing Crossing" (06110)(113) per Linear Foot

4.7 Steel Gas Main Cut and Double Cap:

A. Measurement: Steel gas main cut and double cap, of the various sizes, including all caps, nipples, welding, painting or coating, including excavation and native backfill, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Each installed, tested and accepted.

B. Payment: Steel gas main cut and double cap, measured as provided above, will be paid at the Contract unit price per Each for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere)(Demolition and Removal of Pavement or Other Obstructions Paid Elsewhere) (Pavement Repair or Replacement Paid Elsewhere)(Select Backfill Paid Elsewhere)(Traffic Control Paid Elsewhere)

C. Pay Items:

2" Steel Gas Main Cut and Double Cap (06110)(114) per Each

4" Steel Gas Main Cut and Double Cap (06110)(115) per Each

6" Steel Gas Main Cut and Double Cap (06110)(116) per Each

8" Steel Gas Main Cut and Double Cap (06110)(117) per Each

2" PE Gas Main Cut and Double Cap (06110)(118) per Each

4" PE Gas Main Cut and Double Cap (06110)(119) per Each

6" PE Gas Main Cut and Double Cap (06110)(120) per Each

8" PE Gas Main Cut and Double Cap (06110)(121) per Each

4.8 Clean, Test, Purge, Abandon Gas Mains:

A. Measurement: Clean, test, purge, abandon gas mains, including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Linear Foot cleaned, tested, purged or abandoned and accepted.

B. Payment: Clean, test, purge, abandon gas mains, measured as provided above, will be paid at the Contract unit price per Linear Foot for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices. (Traffic Control Paid Elsewhere)

C. Pay Items:

Field Cleaning, Testing and Purging of Gas Mains (06110)(122) per Linear Foot

Purging, Flooding, and Abandoning Existing Gas Mains (06110)(123) per Linear Foot

4.9 Gas Pipe and Appurtenances Above Ground Painting:

A. Measurement: Gas pipe and appurtenances above ground painting, including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per 8 Hour Day, accepted.

B. Payment: Gas pipe and appurtenances above ground painting, measured as provided above, will be paid at the Contract unit price per 8 Hour Day for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices. (Traffic Control Paid Elsewhere)

C. Pay Items:

Painting of Regulator Stations and Above Ground Steel Piping and Other Related Above Ground Gas Items (06110)(124) per 8 Hour Day

4.10 Connect PE Gas Main to Existing Gas Main:

A. Measurement: PE gas main connection of the various sizes, including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Each.

B. Payment: PE gas main connection, measured as provided above, will be paid at the Contract unit price per Each connection made and accepted.

C. Pay Items:

Connect New 2" PE Gas Main to Existing 2" Gas Main (06110)(125) per Each

Connect New 2" PE Gas Main to Existing 4" Gas Main (06110)(126) per Each

Connect New 2" PE Gas Main to Existing 6" Gas Main (06110)(127) per Each

Connect New 2" PE Gas Main to Existing 8" Gas Main (06110)(128) per Each

4.11 Gas Warning Signs:

A. Measurement: Gas warning signs, including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and or as directed by the ENGINEER, will be measured per Each installed and accepted.

B. Payment: Gas warning signs, measured as provided above, will be paid at the Contract unit price per Each for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices. (Traffic Control Paid Elsewhere)

C. Pay Items:

Warning Signs (06110)(129) per Each

4.12 Owner's Gas Service Line Inspection Fee: Contractor shall pay the Owner ten ($10) dollars per each service line inspection performed by the Owner. The $10/each fee is a pre-set allowance as shown on the Bid Form.

A. Pay Items:

Owners Gas Service Line Inspection Fee (06110)(130)

SECTION 06110 – BORING AND JACKING – PIPE AND SERVICE TUBING
REFERENCE - NO PAY ITEM: *Install Pipe by Boring Method: (Refer to Section 04120 – Water Distribution System and Related Appurtenances.*

(See "Attachments "A" through "G")

END OF SECTION

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ATTACHMENT A

Drug Testing

ATTACHMENT A

DRUG TESTING PROGRAM

1. The CONTRACTOR shall participate in a drug testing program approved by the Louisiana Department of Natural Resources and U.S. Department of Transportation.

2. CONTRACTOR shall certify in writing to the Owner that the drug testing program in which he participated conforms to the U.S. Department of Transportation Pipeline Safety regulations and the Louisiana Department of Natural Resources, Office of Pipeline Safety Regulations.

3. The CONTRACTORS personnel who are involved in the construction of the gas pipeline work shall participate in the approved drug testing program.

4. The drug testing program shall meet shall federal, state, and local regulations related to such a program.

5. Prior to issuance of the Notice to Proceed, the CONTRACTOR shall provide the Owner written proof of each employee's participation in an approved drug testing program, the Notice to Proceed will not be issued until both the Certifications are provided.

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ATTACHMENT B

Fusion Welding Procedures, Procedure Qualification, and Welder Qualification

for POLYETHYLENE PIPE

ATTACHMENT B

Fusion Welding Procedures, Procedure Qualification,
and Welder Qualification for POLYETHYLENE PIPE:

1. Polyethylene Material Classification:

1.1 Welding procedures shall be developed for the following material:
Performance Pipe Company
Driscoplex 6800
Cell Classification 345464C
Polyethylene Pipe Conforming to ASTM D2513 Specification

2. Qualified Welding Procedures:

2.1 The following procedures have been qualified according to Department of Transportation, Title 49, code of Federal Regulations, Subpart F - Section 192.283 (Plastic Pipe - Qualifying Joining Procedures).

2.2 The qualified butt fusion and sidewall fusion procedures shall be as recommended by Performance Pipe Company for the successful fusion of the pipe as described in these specifications.

2.3 Generic Butt Fusion Procedure for Pipe, Tubing, & Fittings:

2.3.1 Clean each pipe end with a clean cloth. Place pipe ends into fusion machine. Bring ends together and check alignment.

2.3.2 Insert facing unit between pipe ends and lock onto guide rods. Face ends of pipe to the stops.

2.3.3 Check alignment of pipe ends. Adjust high-low if necessary. If adjustment is made, reinsert facing unit and reface to the stops. Always tighten the high side, never loosen the low side.

2.3.4 Check heater plate for temperature and wipe surface clean.

2.3.5 Insert heater plate between aligned ends and bring ends firmly in contact with plate, but do not apply pressure. Heat times shall be as recommended by Performance Pipe Company.

2.3.7. Remove heater plate after achieving proper melt bead. Quickly observe the parts to be joined to ensure sufficient and uniform melting patterns. Melt swell bead widths shall be as recommended by Performance Pipe Company.

2.3.8. Bring melted ends together quickly. Do not slam. Apply enough force to roll each bead over to the pipe or fitting surface. Use the manufacturer=s recommended hold pressure. Hold this pressure during cooling.

2.3.9. Allow the butt fusion to cool, under pressure, for the time recommended by the pipe manufacturer.

2.3.10. Do not remove the fused joint from the equipment for an additional three minutes after cooling time. Do not test, stress, pull or lay in ground for 10 to 60 minutes after removal from fusion unit.

2.3.11. Clean heater faces, being careful not to damage coated surfaces - use wooden implement and clean, dry, lint-free non-synthetic rags. Do not use metal implements to clean heater faces.

2.3.12. Each bead after fusion should have the diameters recommended by the pipe manufacturer.

2.3.13. Always install proper inserts in fusion unit for the pipe, tubing, or fittings being joined. A quality butt fusion joint has a double bead rolled back to the body of the pipe.

2.3.14. Heater plates should be double checked with a tempilstik or pyrometer for correct surface temperature.

3. Welder Qualification:

3.1. Those individuals responsible for fusion joining polyethylene gas piping systems must meet the requirements of Title 49 of the Code of Federal Regulations ' 192.285 as it applies to heat fusion and subsequent revisions. The regulations require that each individual performing fusion joining is qualified in the fusion procedure by the following:

3.1.1. Appropriate training or experience in the use of the fusion procedure, and

3.1.2. Making a sample joint according to the procedure that passes the following inspections and tests:

3.1.2.1. The joint must be visually examined during and after joining and found to have the same appearance as a photograph or sample of an acceptable joint that was joined in accordance with the procedure; and

3.1.2.2. The joint must be tested or examined by one of the following methods:

a. Pressure and tensile test as described in 49 C.F.R. ' 192.283; or

b. Ultrasonic inspection and found to be free of flaws that would cause failure; or

c. Cut into at least three (3) longitudinal straps, each of which is:

1. Visually examined and found to be free of voids or unbonded areas on the cut surface of the joint, and

2. Deformed by bending, torque or impact and if failure occurs, it must not initiate in the joint area.

3.1.3. A person must be requalified under an applicable procedure, if during any twelve month period he -

a. Does not make any joints under the procedure; or

b. Has three (3) joints or three (3) percent of the joints he has made, whichever is greater, that are found unacceptable by testing under 49 C.F.R. '192.513.

4. Minimum Fusion Qualification Procedures

4.1. Welder shall be trained and tested under the pipe manufacturer=s written qualification procedures.

4.2. Observe the joining process to determine that the proper procedure is being followed.

4.3. Visually inspect the joint and compare it to a sample or picture of an acceptable joint.

4.4. Allow the joint to cool for at least one hour.

4.5. Cut the sample through the joint area, lengthwise of the pipe, into at least three (3) straps.

4.6. Visually inspect the cut surface of the pipe wall at the joint for voids or unbonded areas.

4.7. Bend the sample 180E.

4.8. If flaws are observed in the joint compare the appearance with pictures of poor joints, recheck the procedure and make another joint.

5. General Requirements for Welding on POLYETHYLENE PIPE:

5.1. Equipment: Fusion joints shall be made by a device that holds the heater plate element square to the ends of the piping, compresses the ends together, and holds the piping in proper alignment while the fused joint cools using the instructions provided by the pipe manufacturer.

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ATTACHMENT C

Welding Procedures, Procedure Qualification, and Welder Qualification for Steel Pipe

ATTACHMENT C
Welding Procedures, Procedure Qualification,
and Welder Qualification for STEEL PIPE

1. Steel Material Classification:

1.1 Welding procedures have been developed for the materials listed in TABLE I.

* TABLE I *

	MATERIAL	SPECIFICATIONS
a.	Casing Pipe	ASTM A252 Grade 2
b.	Pipe	API 5L Grade B Schedule 40 or Standard Class
c.	Fittings (Bends, Crosses, Tees, Reducers, Caps)	ANSI B16.9
d.	Weld Neck Flanges	ANSI B16.5
e.	2" Three Way Tee (Hot Tap)	ASTM A105 - Wall Thickness (Existing Pipe) - .154" Line Pressure - 38 psig
f.	4" Three Way Tee (Hot Tap)	ASTM A106 Grade B - Wall Thickness (Existing Pipe) - .237" Line Pressure - 25 psig
g.	6" Spherical Three Way Tee (Hot Tap)	ASTM A516 Grade 70 - Wall Thickness (Existing Pipe) - .280" Line Pressure = 38 psig
h.	2" Stopple	ASTM A106 or ASTM A519MT1018
i.	6" Stopple	AISI 1018 Low Carbon Steel
j.	Valves	ASTM A216 Grade WCB Carbon Steel Schedule 40 - Butt Welding Ends
k.	PE/Steel Transition	API 5L Schedule 40
l.	"Bonney Thredolet"	ANSI B16.11

2. Qualified Welding Procedures:

2.1 The following procedures have been qualified according to Section 2 (Qualification of Welding Procedures) of the latest edition of API Standard 1104. '

PROCEDURE SPECIFICATIONS FOR SHIELDED METAL ARC BUTT WELDING

A. PROCESS

The welding shall be done by the shielded metal arc welding method using coated electrodes.

Any change in any of the essential variables which are described in the succeeding paragraphs will require a new Procedure Specifications.

B. MATERIALS

This specification shall apply to the welding of the pipe and fittings conforming to:

1. API Specification for Line Pipe (API Standard 5L).

2. API Specification for High--Test Line Pipe (API Standard 5LX) grade X52 or under.

3. Other applicable specifications:

Pipe	Flanges	Fittings
	ASTM A105	ASTM A234, Grade WPA and WPB
ASTM A106 ASTM A381, Grade Y52 and under	ASTM A181 ANSI B16.5 — 1973 (Weld Neck Flanges) ANSI B16.9 - 1973 (Carbon Steel Grade)	Grades WP1, WP12, WP11, WP22, and WPS of ASTM A234 are not included.
	MSS SP-44, Grade Y52 , and under	MSS SP-63, Grade Y52 and under

4. Materials with chemical and mechanical properties which comply with 1, 2 or 3, even though they are not manufactured in conformance with them.

C. DIAMETER GROUP – WALL THICKNESS COMBINATION

Pipe Diameter: 10.751" OD and under
Wall Thickness: .365" and under

D. JOINT DESIGN

The joint geometry- shall be a V-groove bevel as shown on the included sketch; the inside shall not utilize a backing strip.

E. FILLER METAL

For Lincoln Electric Electrodes

Stringer 5/32“ (4MM) E6010
Filler 5/32“ (4MM) E6010

Hot Passes 5/32“ (4MM) E6010
Cap 5/32" (4MM)'E6010

For Phoenix Electrodes

Stringer 1/8" (3.25MM) E6010
Filler 5/32" (4MM) E6010

Hot Passes 1/8“ (3.25MM) E6010
Cap 5/32" (4MM) E6010

F. ELECTRICAL CHARACTERISTICS

The current used for depositing the filler metal shall be direct reverse polarity. The pipe material shall be on the negative side of the line. Voltage and amperage for each size electrode shall be substantially as shown on the included sketches.

G. POSITION AND DIRECTION OF WELDING

The welding shall be performed with the axis of the pipe horizontal and the pipe or assembly held stationary. Welding shall be in the vertical down direction.

H. NUMBER OF WELDERS

One or more welders may be used on the stringer bead and hot passes.

I. TIME LAPSE BETWEEN PASSES

Hot pass shall be started no longer than five (5) minutes after completion of the stringer bead. The filler bead shall be started as soon as practical after the completion of the hot passes.

J. LINE-UP CLAMP

In welding pipe, the abutting ends shall be held in alignment by internal or external clamps with a maximum of 1/16“ high-low at any point on the perimeter of the pipe.

K. LINE-UP CLAMP REMOVAL

External line-up clamps shall not be removed until all of the stringer bead is completed in the segments where there is no interference from parts of the external clamp or until four (4) tacks made at 90° apart have been made.

Internal line-up clamps shall not be removed until 75% of the stringer bead is complete.

The factors of rough terrain, heavy wall pipe, and pipe diameter may make it available in some cases to require clamp engagement until the stringer is 100% complete. A decision to require 100% clamp time can be made on a short-term basis (for three days or less) by the welding

inspector. The necessity of requiring 100% clamp time for more extended construction periods should be referred to the ENGINEER.

L. CLEANING

All slag or flux remaining on any bead of welding should be removed by hand or.power tools before laying down the next successive bead but the required time lapse between passes must be maintained.

M. PREHEAT

None required unless the ambient temperature is 40°F or lower or moisture conditions are present, in which case the area to be welded shall be warmed to approximately 70°F and the surface dried. If the tendency for cracking to occur is observed the weld area shall be uniformly preheated to 300°F with a gas ring, induction coil, or resistance heater.

N. STRESS RELIEF

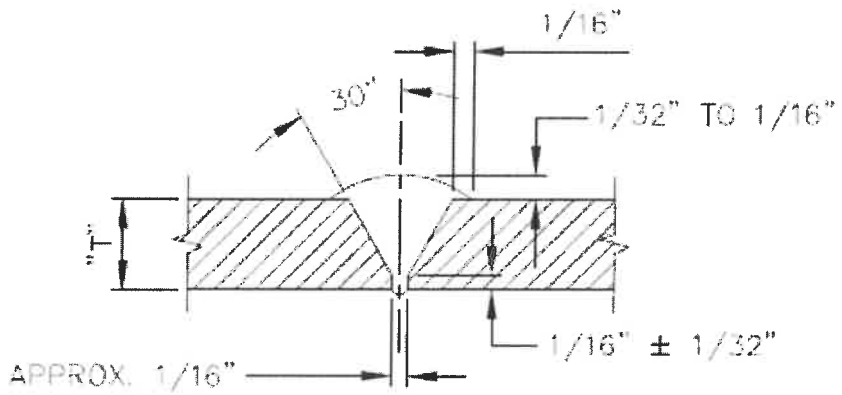
None required.

O. SPEED OF TRAVEL

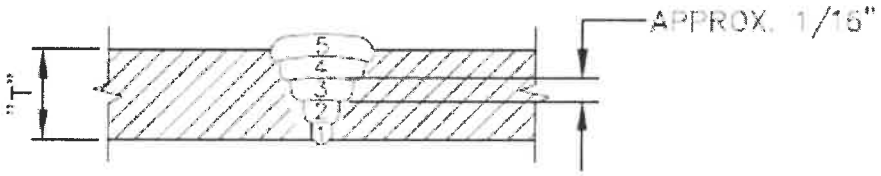
Speed of travel for making the stringer bead shall not exceed 13 I.P.M. Speed of travel will vary for other passes as face width of each layer of welds increases.

P. APPEARANCE OF THE WELDING LAYERS

The welding current and manner of depositing the weld metal shall be such that the weld merges smoothly into the side walls of the welding groove, and there exists no undercutting or overlap on the adjoining base metal. The weld shall exhibit a uniform and repetitive smooth ripple devoid of stress raiser type surface irregularities. Arc striking (arc burn) on the base material adjacent to the groove shall be prohibited.



STANDARD "V" BEBEL BUTT JOINT



SEQUENCE OF BEADS

ELECTRODE SIZE & NUMBER OF BEADS

PIPE WALL THICKNESS	1/8" (E6010) ELECTRODE	5/32" (E6010) ELECTRODE	TOTAL NUMBER OF BEADS
.365" and under	Stringer Hot Passes (2)	Stringer Hot Passes (2) Filler Cap	5

NOTE: FIRST PASS ONLY: 1/8" Phoenix or 5/32" Lincoln Electric
REMAINING PASSES USE: 5/32" Lincoln Electric except hot passes may be made with 1/8" Phoenix
COVER BEAD MAY BE MADE WITH: 5/32" Lincoln Electric

VOLTAGE & AMPERAGE

ELECTRODE DIAMETER	AMERPAGE	ARC VOLTS
1/8”	150-190	40 - 50
5/32”	150-190	40 - 80

_____ PROCEDURE QUALIFICATION TEST _____ WELDER QUALIFCATION TEST

LOCATION _____ TEST NO. _____ DATE _____

CONTRACTOR _____ STATE _____

WELDER _____ MARK _____

HOME ADDRESS _____ STATE _____

SOCIAL SECURITY NO. _____ PHONE NO. _____

WELDING PROCESS _____ POLARITY _____ WELDING DIRECTION _____

TIME LAPSE BETWEEN PASSES _____

SPEED OF WELDING _____

WELDING TIME _____

TYPE OF LINE-UP CLAMP _____

REMOVAL OF LINE-UP CLAMP _____

CLEANING _____

PREHEAT OR POSTHEAT _____

POSITION OF WELD _____ TIME OF DAY _____ TEMPERATURE _____

WEATHER CONDITIONS _____ WIND BREAK USED _____

MAKE OF WELDING MACHINE _____ SIZE _____

PIPE MFR _____ GRADE OF PIPE _____

PIPE DIA. O.D. _____ WALL THICKNESS _____ LENGTHS OF JOINED _____

BRAND OF ELECTRODE _____

BEAD NO.	1	2	3	4	5	6	7
ELECTRODE DIAMETER							
ELECTRODE – AWS NO.							
AMPERAGE RANGE							
VOLTAGE RANGE							

COUPON NO.	1	2	3	4	5	6	7
COUPON WIDTH							
AREA (WIDTH X THICKNESS) SQ. IN.							
MAX. LOAD (POUNDS)							
TENSILE LOAD/AREA							
FRACTURE LOCATION							

MAX. TENSILE STRESS _____ AVG. TENSILE STRESS _____ MIN. TENSILE STRESS _____

REMARKS ON TENSILE

1. _____
2. _____
3. _____
4. _____

REMARKS ON NICK TEST

1. _____
2. _____
3. _____
4. _____

REMARKS ON ROOT BEND TEST

1. _____
2. _____
3. _____
4. _____

REMARKS ON FACE BEND TEST

1. _____
2. _____
3. _____
4. _____

REMARKS ON RADIOGRAPH _____

MEETS THE REQUIREMENTS OF API 1104 YES _____ NO _____

_____ QUALIFIED _____ DISQUALIFIED

TEST MADE AT _____ DATE _____

COMPANY _____ (COMPANY REPRESENTATIVE) _____

3. Welder Qualification:

3.1 Welders shall be qualified to weld on this project according to the requirements of Section 3 (Welder Qualification) of the latest edition of API Standard 1104 and Title 49 of the Code of Federal Regulations §192.227 and §192.229. Welders shall use the qualified welding procedures adopted herein to become qualified. CONTRACTOR shall pay for testing costs to qualify welders on the project.

4. General Requirements for Welding on STEEL PIPE:

4.1 Equipment: Welding machines and appurtenances thereto shall be of size and type suitable for the work, and shall be maintained in such conditions as to insure acceptable welds, continuity of operation, and safety of personnel. Arc and gas welding equipment shall meet the requirements to perform each qualified welding procedure. Any equipment which does not meet these requirements shall be repaired or replaced.

4.2 Materials: Filler metal shall meet the requirements of Section 1.42 of the latest edition of API Standard 1104.

4.3 Production Welding: All welding on this project will be performed by qualified welders using qualified procedures. The procedures outlined in Section 4 (Design and Preparation of a Joint for Production Welding) of the latest edition of API Standard 1104 shall be met.

4.4 Inspection and Testing: A welding inspector provided by the ENGINEER will inspect and test production welds according to Section 5 (Inspection and Testing of Production Welds) and Section 6 (Standards of Acceptability Non-destructive Testing) of the latest edition of API Standard 1104. The ENGINEER shall have the authority to require the CONTRACTOR to remove ten (10%) percent of all welds for destructive testing. The CONTRACTOR shall include the cost associated with removal of welds in the unit price bid per linear foot of steel pipe.

CITY OF ALEXANDRIA, LOUISIANA

ANNUAL REQUIREMENTS CONTRACT
FOR
WATER, WASTEWATER, NATURAL GAS AND
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2026

ATTACHMENT D

Gas Fitters Service Line Plan

ATTACHMENT D

MUNICPAL NATURAL GAS SYSTEM

GAS FITTER SERVCE LINE PLAN

DATE _____

OWNER _____

ADDRESS _____

_____

CONTRACTOR _____

INSPECTED BY_____

WITNESSED BY _____

CERTIFIED RISER CONNECTOR

_____

METER SIZE _____

HWH _____

HEATERS _____

COOK STOVES _____

FLOOR FURNACES_____

HEATING UNITS _____

TOTAL FOOTAGE _____

TOTAL B.T.U. _____

TYPE OF PIPE _____

SIZE OF PIPE _____

RISER CONNECTION_____

GAS COCK _____

TRACER WIRE _____

LENGTH _____

DEPTH AT METER _____

DEPTH AT TAP _____

MEASUREMENT FROM CENTER OF STREET

_____

MEASUREMENT TO THE SIDE, LIGHTPOLE, FIREPLUG, DRIVEWAY, ETC.

_____

PROVIDE SKETCH WITH MEASUREMENTS
IN ABOVE SPACE

CITY OF ALEXANDRIA, LOUISIANA

ANNUAL REQUIREMENTS CONTRACT
FOR
WATER, WASTEWATER, NATURAL GAS AND
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ATTACHMENT E

Gas Service Ticket

ATTACHMENT E

CITY OF ALEXANDRIA

Gas Service Ticket

DATE _____

NAME _____

STREET _____

_____

OLD METER NO. _____

NEW METER NO. _____

PULLED _____

RESET _____

_____

REMARKS:

_____

_____

_____

Service completed by _____

CITY OF ALEXANDRIA, LOUISIANA

ANNUAL REQUIREMENTS CONTRACT
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ATTACHMENT F

Utility Valve Record

UTILITY VALVE RECORD

Contents to be handled: _____ gas – water – sewer _____
(circle one)

Location/address: _____

_____

_____

_____

Size: _____ Make: _____ Type: _____

Valve pressure rating: _____ Gearing: _____

By-pass: __yes/no__ Size and type of By-pass valve: _____
(circle one)

Opens: Clockwise/Counter-clockwise _____ Turns to operate: _____
(circle one)

Set in: _____

Depth to operating nut: _____

Remarks/Comments: _____

_____

_____

_____

_____

Date of installation: _____ Contractor: _____

Sketch of valve location:

CITY OF ALEXANDRIA, LOUISIANA

ANNUAL REQUIREMENTS CONTRACT
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2026

ATTACHMENT G

Utility Pipe Data Sheet

UTILITY PIPE DATA SHEET

Project Name: _____

Date of Installation: _____ Contractor: _____

Location & Description of Project:

_____

_____

_____

_____

_____

_____

DATA	CARRIER PIPE	CASING (if used)
Contents to be handled (water, gas, sewer)		
Pipe Material		
Specification & Grade of Pipe		
Outside Diameter		
Wall Thickness		
Yield Strength (PSI)		
Maximum allowable operating pressure (PSIG)		
Type of Joint (welded, mechanical, butt-fused)		
Method of installation (bore, open cut)		
Average depth of pipe		
Coating material		
Cathodic protection		
Length of pipe		

CITY OF ALEXANDRIA, LOUISIANA

ANNUAL REQUIREMENTS CONTRACT
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PART 7 – GENERAL (SITE RELATED)

Section 07110 - EROSION CONTROL AND SOIL STABILIZATION
Section 07120 - CLEARING, GRUBBING AND STRIPPING
Section 07130 - SELECT FILL MATERIAL
Section 07140 - REMOVAL OF STRUCTURES AND OBSTRUCTIONS
Section 07150 - EXCAVATION, BACKFILL AND COMPACTION OF UTILITY TRENCHES
Section 07160 - TEST PITS
Section 07170 - BORING AND JACKING - CASING, PIPE AND SERVICE TUBING
Section 07190 - SHEETING AND BRACING
Section 07210 - AGGREGATE SURFACE REPAIR
Section 07220 - TRAFFIC MAINTENANCE AGGREGATE
Section 07230 - DEWATERING
Section 07240 - STREET PAVEMENT REPLACEMENT AND PATCHING
Section 07250 - FENCES
Section 07270 - TEMPORARY SIGNS, BARRICADES AND BARRIERS
Section 07280 - BEDDING MATERIAL
Section 07290 - SAW CUT PAVEMENT
Section 07310 - CONCRETE FORMWORK
Section 07320 - CONCRETE REINFORCEMENT
Section 07330 - CAST-IN-PLACE CONCRETE
Section 07340 - FLOWABLE FILL
Section 07350 - MISCELLANEOUS TASK ORDER ITEMS

SECTION 07110

EROSION CONTROL AND SOIL STABILIZATION

PART 1- GENERAL

1.1 Scope: This Section covers the installation of temporary and permanent erosion controls, slope protection systems, etc., as specified or as directed by the ENGINEER.

1.2 Environmental Requirements: Protect adjacent properties, prevent soil and sediment erosion and minimize water quality degradation in receiving waters throughout the life of the contract.

1.3 Referenced Standard: State of Louisiana, Department of Transportation and Development, "Louisiana Standard Specifications for Roads and Bridges", 2016 Edition.

Section 204	-	Temporary Erosion Control
Section 711	-	Rip Rap
Section 714	-	Slab Sodding
Section 715	-	Topsoil
Section 716	-	Vegetative and Fiber Mulch
Section 717	-	Seeding
Section 718	-	Fertilizer and Agricultural Lime
Section 720	-	Erosion Control Systems
Section 739	-	Hydro Seeding
Section 1002	-	Asphalt Cement, Emulsions and Additives
Section 1018	-	Miscellaneous Materials
Section 1019	-	Geotextile Fabrics and Geocomposite Systems

(All references made therein to measurement and payment are deleted).

1.4 Submittals: Provide product data in conformance with Section 03340 – Shop Drawings, Samples and Project Data.

PART 2 - PRODUCTS

2.1 Topsoil: Available on-site topsoil is defined as non plastic silty loam located in the first zero to four (0" - 4") inches of the natural surface, having a pH of 5.9 to 6.6 and an organic matter content greater than two percent (2%) by weight. Generally, the upper part of the soil that is richest in organic matter is most valuable. Topsoil shall be free of debris, noxious weeds, toxic substances, muck, and rocks one half (1/2") inch and larger, clay, debris and any other undesirable matter that would be detrimental to the intended use of the topsoil for this project.

2.2 Bales: Hay or straw bales for siltation control as specified on DRAWINGS. Bale stacks for each bale shall be a minimum of 4-feet in length and shall be either two #4 rebars, two steel pickets, or two 2-inch x 2-inch hardwood stakes driven 1'-6" into ground.

2.3 Erosion Control Blankets: Comply with Section 720 and sub section 1018.15 of the referenced Standard.

2.4 Silt Fence: Silt fence for siltation control shall be LDOTD Type "F" filter fabric. Silt fence stakes shall be a minimum of 60 inches in length and shall be 2-inch x 2-inch hard wood stakes driven 1'-6' into ground. Fence mesh shall be 14 ga. standard woven live stock wire with 6 inches x 6 inch spacing.

2.5 Seed: Grass shall be an approved quick-growing species suitable to the area, providing a temporary cover, which will not compete with permanent grasses. Rye grass is the only acceptable grass for winter cover. Comply with Section 717 and Subsection 1004.01.03 of the referenced Standard.

2.6 Mulches: Mulch shall comply with Section 716 and sub section 1004.04 of the referenced Standard. Emulsified Asphalt shall conform to Section 1002 of the referenced Standard.

2.7 Fertilizer: Comply with Section 718 and sub section 1004.01.

2.8 Agricultural Lime: Comply with Section 718 and sub section 1004.02 of the referenced Standard.

2.9 Watering: Maintain continuous watering as required to establish temporary and permanent growth. Comply with sub section 717.07 of the referenced Standard.

2.10 Stone for Temporary Construction Access Drive: Stone shall be 8" thick (min.) and shall be 2-3" ø (#4 Ballast).

2.11 Rock Check Dam: Stone shall be 2-3" ø (#4 Ballast). Rip rap shall be 30 lb. class in conformance with Section 711 of the referenced Standard.

2.12 Hydro-Seeding: Refer to Section 739 of the referenced Standard.

2.13 Filter Fabric: Geotextile filter fabric shall be Class D in conformance to Section 1019 of the referenced Standard.

2.14 Permanent Vegetative Cover: All areas disturbed due to construction shall receive permanent vegetation in addition to the temporary measures required herein. Seeding, fertilization and agricultural lime and or soil amendments shall conform to this Section. Areas designated to receive sod shall receive St. Augustine, Common Bermuda or Centipede as called for on the Bid Form.

2.15 Rip-Rap: Rip-rap shall be 55 lb. Class in conformance with Section 711 of the referenced Standard. Rip-Rap shall be a minimum of eighteen (18") inches thick. Geotextile fabric for Rip-Rap shall be Class D in conformance with Section 1019 of the referenced Standard.

PART 3 - EXECUTION

3.1 Erosion Control:

A. General: Erosion and sedimentation control including establishment of temporary and permanent vegetative cover by means as specified herein, or as directed by the ENGINEER and shall be carried on and maintained continually throughout the Construction Contract. Install, implement, and maintain erosion control in conformance with applicable Sections of the referenced Standard. Newly constructed storm drainage pipes and inlets shall be protected as required to ensure storm water sediment does not leave the site during rain events by use of #4 ballast and approved LDOTD QPL filter cloth or other means acceptable to the ENGINEER but, in no case shall an unforeseen and or broadcasted rain event cause flooding to surrounding areas due to sediment control. CONTRACTOR shall maintain sediment control at all times by shall use his best practical means to protect the public and himself and or newly installed facilities. All non paved areas disturbed due to construction shall be seeded, fertilized and watered daily.

B. Erosion Control and Slope Protection Implementation:

1. Place erosion control systems in accordance with Section 720 of the referenced Standard and as may be dictated by site conditions in order to maintain the intent of the Specifications and Permits at no additional cost to OWNER.

2. Deficiencies or changes to erosion control and soil stabilization shall be implemented as site conditions change conforming to Section 204 of the referenced Standard.

3. OWNER has authority to limit surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and embankment operations and to direct CONTRACTOR to provide immediate permanent or temporary pollution and sedimentation control measures at no additional cost to the OWNER.

4. Maintain temporary erosion control systems as directed by OWNER or governing authorities to control siltation during life of contract. CONTRACTOR shall respond to maintenance or additional work ordered by OWNER or governing authorities within 24 hours or sooner if required at no additional cost to the OWNER.

5. CONTRACTOR will be required to incorporate permanent erosion control features into project at earliest practical time to minimize need for temporary controls.

6. Seed and mulch temporary and permanent cut slopes as excavation proceeds to extent considered desirable and practical.

7. Slopes that erode easily or that will not be graded for a period of 7 days or more shall be temporarily seeded as work progresses with wheat, rye, or oats application at no additional cost to the OWNER.

C. Clean-up: All temporary measures, not directed by the ENGINEER to remain, shall be removed and disposed of in an environmentally sound manner. All areas re-disturbed due to clean up shall receive permanent measures as specified herein.

3.2 Topsoil:

A. Spreading Area Priority: Topsoil shall be re spread in the following priority areas, beginning with the highest priority area; 1. Ditch embankment slopes beginning upstream and working downstream beginning at the top of the embankment; 2. Swale slopes beginning upstream and working downstream; 3. Gentle slopes; 4. Lower tier embankments; 5. Remaining areas.

B. Spreading Thickness: Topsoil shall be re spread not less than four inches (4") thick. The thickness specified herein is compacted thicknesses.

C. Stripping: Strip topsoil from those areas that will be disturbed by clearing, excavation and filling operations. The entire site shall NOT be stripped at once. Stripping shall progress as earthwork demands. Stripping depths varies but is anticipated to be four (4") inches thick over the site. CONTRACTOR shall be responsible for determining the depth of stripping.

D. Stockpiling: Topsoil for re-use shall be stockpiled in areas to be determined by the CONTRACTOR. Generally, re-spreading is easier and more economical when topsoil is stock-piled in small piles near the area(s) where it will be re-used. Stockpiles shall not exceed slopes of 2: 1 and shall not be higher than five feet (5') to prevent compaction. Stockpiles shall contain similar type soils. Do not mix topsoils from different areas where they are to be returned.

E. Stockpile Maintenance: Protect topsoil stockpiles by temporarily seeding as soon as possible and in NO case any later than fifteen (15) days after the formation of the stockpile. If stockpiles are to remain unused for a period greater than three (3) months they shall be permanently stabilized with appropriate vegetation to control erosion, contamination and weeds. All Stockpiles shall be protected with silt fences regardless of storage time.

F. Installation: The top six inches (6") of the sub grade or area to receive topsoil shall have a pH of 5.1-7.1 to support adequate vegetation. CONTRACTOR shall provide soil amendments in conformance with this Section. This is a requirement for all areas disturbed due to construction whether the site yields sufficient quantities of topsoil or not. In general, any areas requiring topsoil, seeding and/or sod shall be prepared accordingly. Once the area meets the aforementioned requirements and immediately prior to spreading the topsoil, loosen the sub grade a minimum of six inches (6") by disking and/or scarifying to ensure bonding of the prepared sub grade and topsoil. Spread the topsoil to the

thicknesses specified herein. Compact the topsoil enough to ensure good contact with the prepared sub grade, but avoid excessive compaction as it increases run off and inhibits germinations. Do not install topsoil in areas that are wet, muddy, frozen, compacted and/or dried hard. Lightly disk immediately prior to seeding.

3.3 Sodding:

A. Soil Preparation: Loosen the soil surface for incorporation of soil amendments to facilitate quick root growth from newly installed sod. Cultivate the area by roto-tilling or spading to a depth of 4-6 inches. Remove all debris such as roots, wood, large clods and such. Test soil for proper pH factor and nutrient deficiencies. Apply a balanced fertilizer (as required) to the area. Under large trees apply ag lime before sodding. Complete final grading and smoothing by hand raking or tractor mounted box blade. Slope soil away from structures as much as possible to prevent drainage problems. Roll and water graded areas to settle and firm the surface and to reveal low areas that require more soil.

B. Installation: Begin placement of sod along the longest straight line and work toward the middle. Snugly fit the edges of sod against each other. Avoid gaps and overlaps. On sloped areas, install sod rolls or slabs lengthwise and parallel to the slope. Stagger the joints in a checkerboard fashion. Grades 3:1 or steeper, shall receive sod staples or stakes to hold the sod in place until root establishment. After installing the sod, tamp or roll the area to eliminate air pockets and to ensure proper contact between the sod and underlying soil.

C. Watering: Water installed sodding immediately. Initially, apply at least 1" of water so that the soil underneath is very wet. Pull back a corner of sod to verify watering is penetrating the underlying soil. Make sure that the water is getting to all the areas of sod and that no corners or edges are not watered. Weather conditions will dictate the frequency and amount of water to apply. Keep the underlying soil moist until sod is well rooted. Frequent and lighter daily watering will be adequate in the absence of rainfall. As the sod becomes more established, begin deeper, less frequent water applications to promote deeper rooting and hardier sod. Sodding must have enough moisture to survive hot, cold or dry conditions.

D. Maintenance: During the first two of weeks after installation, keep traffic off newly planted sodding. Do not mow until sod is firmly rooted into the underlying soil. Once rooted, established and clearly growing, mow the sod regularly removing less grass height as opposed to mowing taller grass less frequently. The proper height in which to mow sodding will depend upon the variety. Do not remove more than 1/3 of the grass height in a single mowing. The CONTRACTOR will be responsible for weed control in new sod for the duration of the Contract.

PART 4 – MEASUREMENT AND PAYMENT

4.1 Hydro-Seeding:

A. Measurement: Hydro-Seeding, including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and/or as directed by the ENGINEER, and measured by the Square Yard installed and accepted.

B. Payment: Hydro-seeding, measured as provided above, will be paid at the Contract unit price per Square Yard for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract Documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices.

C. Pay Item:

Hydro-Seeding (07110)(01) per Square Yard

4.2 Slab Sod:

A. Measurement: Slab sod, including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and/or as directed by the ENGINEER, and measured by the Square Yard installed and accepted.

B. Payment: Slab sod, measured as provided above, will be paid at the Contract unit price per Square Yard for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract Documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices.

C. Pay Item:

Slab Sod (07110)(02) per Square Yard

END OF SECTION

SECTION 07120

CLEARING, GRUBBING AND STRIPPING

PART 1 - GENERAL

1.1 Scope: This Section covers all clearing, grubbing and stripping work required for the construction of the work.

1.2 Clearing and Grubbing:

A. The CONTRACTOR shall clear and grub areas required by the ENGINEER dependent upon existing field conditions as required to construct the project.

B. Care shall be taken to leave nothing of material size or accumulated mass which thereafter may float or obstruct any pipe or waterway.

C. The CONTRACTOR shall not cut or injure any trees or other vegetation outside the limits of the areas on which work is to be done without permission and he shall guard against like action by his employees.

1.3 Stripping: The CONTRACTOR shall strip areas which are designated by the ENGINEER for the proposed location of any aboveground facility. The limits of the stripping shall be within the area so directed.

1.4 Right to Wood and Logs: The respective owners of the land over which an easement passes shall have the right to cut and remove logs and other wood of value in advance of the CONTRACTOR'S operations. All remaining logs and other wood removed in the course of clearing shall become the property of the CONTRACTOR.

PART 2 - PRODUCTS

2.1 Equipment:

A. Equipment used for clearing and grubbing shall be at the CONTRACTOR'S option.

B. Blasting will not be permitted.

PART 3 - EXECUTION

3.1 Clearing:

A. The CONTRACTOR shall cut or otherwise remove all trees, saplings, brush and vines, (except those trees and other vegetation marked for retention by the OWNER); windfalls, logs and trees lying on the ground; dead trees and stubs more than one foot high above the ground surface, but not their stumps; trees which have been partially uprooted by natural or other causes, including their stumps; and other matter such as snags, leaves, sawdust, bark and refuse.

B. Except where clearing is done by uprooting with machinery or where stumps are left longer to facilitate subsequent grubbing operations, trees, stumps, and stubs to be cleared shall be cut as close to the ground surface as practicable, with no more than six (6) inches remaining above the ground surface in the case of small trees, and twelve (12") inches in the case of large trees. Saplings, brush, and vines shall be cut off close to the ground.

3.2 Grubbing: The CONTRACTOR shall remove all stumps within the servitude or designated project area completely, remove all roots larger than three (3") inches in diameter to a depth of 18 inches, and remove all roots larger than 1/2 inch in diameter to a depth of six (6) inches. Such depths shall be measured from the existing ground surface or the proposed finished grade, whichever is lower.

3.3 Stripping: Topsoil shall be removed to its full depth where it occurs in areas to be filled or excavated and shall be stockpiled for use in finish grading. All precautions shall be taken to avoid contamination of topsoil by other excavated material and to prevent washing of topsoil by other excavated material and to prevent washing of topsoil into excavations, drainage or watercourses.

3.4 Depressions: Except in areas to be excavated, depressions caused by grubbing operations shall be filled with suitable material which shall be compacted to conform to the surrounding ground.

3.5 Disposal:

A. All material collected in the course of the clearing and grubbing that will not remain shall become the property of the CONTRACTOR and shall be disposed of in a manner satisfactory to the OWNER. Such disposal shall be carried on after removal of the materials in the clearing and grubbing operations and shall not be left until the final clean up period.

B. Burning will not be permitted.

C. Prior to depositing surplus material at any off site location, the CONTRACTOR shall obtain a written agreement between himself and the owner of the property on which the disposal is proposed giving permission for the CONTRACTOR to enter and deposit the material at no expense to the project OWNER. A copy of the agreement shall be furnished to the OWNER.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Clearing and Grubbing:

A. Method of Measurement: Clearing and Grubbing, completed and accepted as specified, shall be measured by the Acre.

B. Payment: Clearing and Grubbing, measured as provided above, will be paid at the Contract unit price per Acre which price and payment shall constitute full compensation for furnishing all materials, equipment, tools, labor, hauling, traffic control, signs barricades, safety items, and incidentals necessary to complete this item in accordance with the Specifications.

C. Pay Item:

Clearing and Grubbing (07120)(01) per Acre

- END OF SECTION -

SECTION 07130

SELECT FILL MATERIAL

PART 1 - GENERAL

1.1 Scope: This Section covers providing and placing select fill material in areas where existing native material which was excavated to complete the work is unsuitable for backfill. Select Fill Material shall only be incorporated and paid for as authorized by the Engineer.

PART 2 - PRODUCTS

2.1 Select Fill Material (Paved Area): Select fill material shall have a unified soil classification (ASTM D 2487) as CL (A-2-4) (sand clay) or better with a plasticity index (PI) range of 10-20 and a maximum liquid limited (LL) of 25-35. Maximum aggregate size is 1 ½". Material shall be free of all vegetation noxious matter and all foreign debris. This material shall be used beneath and/or within five feet (5') of paved areas and where directed by the ENGINEER.

PART 3 - EXECUTION

3.1 General: Select fill material shall only be installed at the direction of the ENGINEER. Select fill material shall be used for backfill in areas where existing native material is unusable due to unusually high moisture content, unusually high organic content or other physical properties deemed adverse or objectionable by ENGINEER.

3.2 Compaction: All "select fill material" shall be compacted to not less than 95% Standard Proctor Density within two (2%) percent optimum moisture content.

3.3 Placement Control: To insure uniform placement and compaction, select fill material shall be placed in nine (9") inch maximum loose lifts and compacted as specified in Paragraph 3.2 above.

3.4 Method of Delivery: Any vehicle utilized for the delivery of select fill material shall be examined and approved by the ENGINEER prior to delivery. The maximum yardage calculations for each vehicle to be used will be submitted by the CONTRACTOR and verified by the ENGINEER on each vehicle prior to first delivery by said vehicle. Each load shall be dumped clean or scraped clean for acceptance of load.

3.5 Documents Accompanying Load: Each load must be accompanied by a delivery ticket which must contain the following:

A. Load Number (loads must be sequentially numbered).

B. Yardage contained on each load.

C. Vehicle capacity as calculated by CONTRACTOR and approved by the ENGINEER.

D. Vehicle number or identification.

E. Operator's name.

F. Date and time of delivery.

Each delivery ticket must be signed by a checker on site representing the OWNER or the ENGINEER at a point to be designated by the ENGINEER. A deduction shall be made for any deficiency in the quantity of dirt actually delivered if less than the quantity specified on the delivery ticket and/or acknowledgment concerning the deduction must be signed by the operator of the vehicle.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Select Fill Material (As Authorized by Engineer):

A. Measurement: Select fill material, installed at the direction of the Engineer, will be measured by the Cubic Yard, truck measure installed and compacted.

B. Payment: Select fill materials, in place and accepted, measured as provided above, will be paid at the Contract unit price per Cubic Yard, which price and payment shall constitute full compensation for furnishing all materials, equipment, tools, labor, hauling, traffic control, signs, barricades, safety items and incidentals necessary to complete this item in accordance with the Drawings and Specifications.

C. Pay Item: A-2-4 Trench Backfill (Select) (Paved Areas and as Authorized by Engineer) (07130)(01) per Cubic Yard.

- END OF SECTION -

SECTION 07140

REMOVAL OF STRUCTURES AND OBSTRUCTIONS

PART 1 - GENERAL

1.1 Scope: This Section includes furnishing of all labor, materials, tools and equipment, and perform all operations necessary for demolition, abandonment and removal of those existing structures and other obstructions not designated or permitted to remain for construction as directed by the ENGINEER.

1.2 Referenced Standard: Work shall conform to the following Section of the State of Louisiana, Department of Transportation and Development, "Louisiana Standard Specifications for Roads and Bridges", 2016 Edition, except as may be modified herein:

Section 202 - Removing or Relocating Structures and Obstructions
Section 710 - Flowable Fill
Section 723 - Granular Material

All references made therein to measurement and payment are hereby deleted.

PART 2 - PRODUCTS

2.1 Backfill Material (non-paved areas) for Removal of Structures and Obstructions: Backfill material for removal of structures and obstructions shall be native material, if acceptable to ENGINEER.

2.2 Select Fill: Refer to Section 07130 – Select Fill Material.

2.5 Non Shrink Cement Grout: Refer to Section 07330 – Cast-In-Place Concrete, paragraph 2.3, Non-Shrink Cement Grout.

PART 3 - EXECUTION

3.1 General: The CONTRACTOR shall remove, haul off and satisfactorily dispose of all structures and obstructions designated for demolition, etc. that would interfere with construction or are required to permit construction as designed. It shall include backfilling resulting trenches, holes, pits, etc. Debris or excess material shall be disposed of off the project site.

3.2 Material Difference in Conditions: If structures or obstructions are encountered which differ materially from those ordinarily encountered, said conditions shall be immediately reported to the ENGINEER and the scope of work determined and appropriate costs negotiated for a change order.

3.3 Salvageable Material: CONTRACTOR shall meet with OWNER prior to beginning work to determine which materials shall be salvaged. CONTRACTOR shall be responsible for delivering designated salvageable material to the OWNER.

3.4 Compaction: Compaction shall conform to Section 07150 - Excavation, Backfill and Compaction of Utility Trenches.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Removal of Asphalt or Concrete Surface:

A. Measurement: Pavement removal, of various types, including all cleanup and final and/or dress grading, and including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and/or as directed by the ENGINEER, and measured by the Square Yard removed.

B. Payment: Pavement removal, measured as provided above, will be paid at the Contract unit price per Square Yard for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract Documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices. (Select Backfill Paid Elsewhere) (Traffic Control Paid Elsewhere) (Saw-Cut Paid Elsewhere)

C. Pay Item:

Removal of Asphalt or Concrete Surfaces (07140)(01) per Square Yard

- END OF SECTION -

SECTION 07150

EXCAVATION, BACKFILL AND COMPACTION OF UTILITY TRENCHES

PART 1 - GENERAL

1.1 Scope: This Section covers excavation, backfill and compaction associated with utility trenches.

1.2 General:

A. Work specified under this Section shall be satisfactorily executed, regardless of subsurface materials encountered, as shown on the Drawings or as otherwise directed by the ENGINEER.

B. Although it is the intention to adhere to the Drawings, the CONTRACTOR is informed that the locations of proposed utilities and other structures shown on the Drawings are approximate. The ENGINEER reserves the right to make changes in location, lines, and grades where such adjustments may be necessary or advantageous.

C. Excavation, dewatering, sheeting, and bracing shall be carried out in such a manner as to eliminate any possibility of undermining or disturbing the foundations of any existing structure or any work previously completed under this contract.

1.3 Care and Restoration of Property:

A. Excavating machinery, cranes, and all other heavy equipment, shall be operated with care to prevent damage to trees. Where required, trees within or adjacent to the work site shall be braced by suitable means at the ENGINEER'S direction.

B. Branches, limbs, trunks and roots shall not be cut except by permission of the ENGINEER. All cutting shall be smoothly and neatly done without splitting or crushing. In case of cutting or unavoidable damage to branches, limbs and trunks of trees, the cut or damaged portions shall be neatly trimmed and covered with an application of grafting wax or tree healing paint as directed.

C. Cultivated hedges, shrubs, and plants which might be injured by the CONTRACTOR'S operations shall be protected by suitable means or shall be dug up and temporarily replanted and maintained. After the construction operations have been substantially completed, they shall be replanted in their original positions and cared for until growth is re-established. If cultivated hedges, shrubs, and plants are injured to such a degree as to affect their growth or diminish their beauty or usefulness, they shall be replaced by items of kind and quality at least equal to the kind and quality existing at the start of the work. Where cultivated hedges, shrubs and plants in physical interference with the work exist and encroach upon highway right-of-way, they shall be replanted inside the property line of their respective owner. If said owner desires, he may replant such cultivated hedges, shrubs and plants at other areas within his property after removal by the CONTRACTOR.

D. On paved surfaces, the CONTRACTOR shall not use or operate tractors, bulldozers, or other power operated equipment of which the treads of which are so shaped as to cut or otherwise damage such surfaces.

E. All lawns, paved surfaces, roadways, and structures which have been damaged by the CONTRACTOR'S operations shall be restored to a condition at least equal to that in which they were found immediately prior to the beginning of operations.

F. The restoration of existing property of structures shall be done as promptly as practicable and shall not be left until the end of the construction period.

1.4 Applicable Publications: The publication listed below forms a part of this Specification to extent referenced. The publication is referred to in the text by the basic designation only:

American Society for Testing and Material (ASTM) Publications:

D 698-78 Test Methods for Moisture - Density Relations of Soils and Soil- Aggregate Mixtures, Using 5.5 lb. (2.49 kg) Rammer and 12 inch (304.8 mm) Drop

D 2487-85 Classification of Soils for Engineering Purposes

PART 2 - PRODUCTS

2.1 Backfill Materials (Non-Paved Areas): Backfill material for utility trenches shall be native material if acceptable to the ENGINEER. Where native material is unsuitable, and where directed by the ENGINEER, "Select Fill" shall be used. Refer to Section 07130 – Select Fill Material.

2.3 Backfill Materials (Paved Areas): Backfill material for utility trenches in paved areas, areas to be paved, or within five (5') feet thereof, "Select Fill" shall be used. Refer to Section 07130 - Select Fill Material.

PART 3 - EXECUTION

3.1 General:

A. The CONTRACTOR shall make excavations in such a manner and to such a width as will give suitable room for or laying and adjoining pipe; shall furnish and place all sheeting, bracing, and supports; shall do all pumping, and draining; and shall render the bottom of the excavation firm and dry and in all respects acceptable.

B. In no case shall the earth be plowed, scraped, or dug by machinery so near to the finished grade at the bottom of the excavations as to result in disturbance of material below said grade. All loose materials shall be removed from the bottom of the excavation so that the bottom shall be in an undisturbed condition.

3.2 Separation of Surface Materials:

A. From areas within which excavations are made, loam and topsoil shall be carefully removed and separately stored to be used again as directed; or, if the CONTRACTOR prefers not to separate surface materials, he shall furnish, without additional compensation, clean loam and topsoil at least equal in quantity and quality to that excavated. When excavations are made in paved surfaces the pavement shall be removed so as to provide a clean uniform edge with a minimum disturbance of remaining pavement.

B. If pavement is removed in large amount or pieces, it shall not be mixed with other excavated material, but shall be disposed of away from the work site before the remainder of the excavation is made.

3.3 Sheeting and Bracing: Refer to Section 07190 –Sheeting and Bracing.

3.4 Drainage:

A. At all times during construction, the CONTRACTOR shall temporarily provide, place and maintain ample means and devices with which to remove promptly, and dispose properly of, all water entering trenches and other excavations, or water that may flow along or across the site of the work. Excavations shall be kept dry until the pipes and appurtenances to be built therein have been completed, to such extent that they will not be damaged. At that time, the CONTRACTOR may remove such temporary means and devices.

B. All water pumped or drained from the work shall be disposed of in a manner satisfactory to the ENGINEER, without undue interference with other work or damage to pavements, other surfaces, or property.

3.5 Excess Excavation:

A. If, in the opinion of the ENGINEER, the material at or below the depth to which excavation for pipes would normally be carried is unsuitable for foundation, it shall be removed to such widths and depths as directed by the ENGINEER and shall be replaced with suitable material. A change order shall be negotiated for suitable material purchase and installation.

B. Where the bottom of the excavation shall, by error of the CONTRACTOR, have been taken to a depth greater than the depth specified, shown on the Drawings, or directed by the ENGINEER, said condition shall be corrected by refilling to the proper grade with screened gravel, crushed stone or shell, or the design shall be altered in a fashion acceptable to the ENGINEER to compensate for said error. The costs of all corrective measures shall be borne by the CONTRACTOR.

C. If, through failure or neglect of the CONTRACTOR to conduct the excavation work in the proper manner, the surface of the subgrade is in an unsuitable condition for proceeding with construction, the CONTRACTOR shall, at his own expense, remove the unsuitable material and replace it with suitable material, compacted to meet with the approval of the ENGINEER before any work is placed thereon. Failure of the

CONTRACTOR to control surface or ground waters adequately, premature excavation at the work site, or other manifestations of the CONTRACTOR'S neglect or improper conduct of work, as determined by the ENGINEER, shall be grounds for requiring removal and replacement of unsuitable subgrade without additional compensation.

3.6 Trench Excavation in Fill: Before laying pipe in areas of fill, the following procedure shall be required:

A. Fill material shall be placed and properly compacted to final grade or to three feet above the top elevation of the pipe, whichever is less. Under certain circumstances the CONTRACTOR may request modification of this requirement. Any modification must be detailed in writing and approved by the ENGINEER.

B. Particular care shall be taken to ensure maximum consolidation of material under the pipe location.

C. The pipe trench shall then be excavated in the prescribed manner as though in undisturbed soil.

3.7 Excavation Near Existing Structures:

A. Excavation near an existing structure shall not be allowed closer to the structure than the depth of the excavation below the bottom of the foundation without shoring the excavation with sheeting.

B. The CONTRACTOR'S attention is directed to the fact that underground utilities may exist within or immediately adjacent to the areas of proposed construction. No attempt has been made to show all of the services, and the completeness and accuracy of the information is supplied for the purpose of providing the CONTRACTOR with an indication as to the approximate locations of utilities at the work areas so that he will be made aware of their presence.

C. All utility lines shall be located by the CONTRACTOR on the ground with pipe locator equipment well ahead of the work at all times. All such locations shall be plainly marked by coded paint symbols on pavement or by marked stakes in the ground. Such locations shall be established in accordance with Section 07160 - TEST PITS in advance of all excavation. All such location work shall be provided by the CONTRACTOR, to the satisfaction of the ENGINEER, at no extra cost.

D. As the excavation approaches pipe, conduits, or other underground structures, digging by conventional trenching machine methods shall be discontinued. Only manual methods of excavating shall be employed around buried utilities. The CONTRACTOR shall include manual excavation in the work to be done under this contract. No additional compensation shall be paid to the CONTRACTOR for excavations by hand.

3.8 Protection of Existing Structures:

A. All existing pipes, poles, wires, fences, curbing, property line markers, and other structures which, in the opinion of the OWNER, must be preserved in place without being

temporarily or permanently relocated, shall be carefully supported and protected from damage by the CONTRACTOR. In case of damage, the CONTRACTOR shall notify the property owner so that the proper steps may be taken to repair any and all damage done. When the property owners do not wish to make the repairs themselves, all damage shall be repaired by the CONTRACTOR; of, if not promptly done by him, the owner may have the repairs made at the expense of the CONTRACTOR.

B. All utility services shall be supported by suitable means so that the services do not fail when tamping and settling occurs. No separate item is provided for timber service supports, and the CONTRACTOR shall include same in the unit price bid for pipeline construction.

C. The CONTRACTOR shall not be compensated for any additional work involved if utility line or underground structure crosses the trench line transversely above or below the utility line.

3.9 Relocation and Replacement of Existing Structures:

A. If, in the course of construction, the CONTRACTOR encounters utility services and/or structures of any kind which encroach upon or are encountered near and substantially parallel to the edge of the excavation and which, in the opinion of the ENGINEER, will impede progress to such an extent that satisfactory construction cannot proceed, they shall be relocated, removed (later to be restored), or replaced as follow:

1. Whenever the CONTRACTOR encounters any of the conditions as described above and is so ordered in writing, he shall do the whole of or such portions of the work as directed; change the location of, remove and later restore, or replace such structures; or assist the OWNER thereof in so doing. For such work the CONTRACTOR shall be issued a change order for extra work.

2. In removing existing pipes or structures as described above, the CONTRACTOR shall use care to avoid damage to materials, and the OWNER shall include for payment only those new materials which, in his judgement, are necessary to replace those unavoidably damaged.

B. When fences interfere with the CONTRACTOR'S operations, he shall remove and, unless otherwise specified, later restore them to the condition at least as good as that in which they were found immediately before the work was begun, all without additional compensation unless a specific pay item has been provided in the bid form for such work. The restoration of fences shall be done as promptly as possible and not left until the end of the construction period.

3.10 Backfilling and Compaction - General:

A. Backfilling shall be done as promptly as is consistent with non-injury to the work but no backfilling shall be done without the ENGINEER'S express permission.

B. A bulldozer or other blade shall not be used in placing backfill; however, placement of backfill by mechanical equipment with various type buckets may be permitted at the ENGINEER'S approval.

C. The backfill material shall be free from cinders, ashes, refuse, boulders, rocks or stones, unsuitable organic material or other material which in the opinion of the ENGINEER is unsuitable. Where excavated material or any portion thereof is deemed unsuitable for backfilling material, the CONTRACTOR shall procure and place approved suitable materials, as ordered by the ENGINEER.

3.11 Backfilling in Open Trench:

A. As soon as practicable after the pipe has been placed and the pipe joints have been properly made, the backfilling shall begin, and shall continue without delay. If a screened gravel, shell, or concrete envelope is not used, the backfill material shall be placed simultaneously on both sides of the pipe, so that there will be no displacement of pipe alignment in strict conformance with manufacturers recommendation. In placing the material, care shall be taken that stones do not strike the pipe.

B. The backfill at the sides of the pipe up to the top of the pipe shall be hand placed and thoroughly compacted using approved hand tampers.

C. The backfill up to a level of one foot above the top of the pipe shall be placed in six (6) inch layers, leveled along the length and width of the trench and thoroughly compacted with approved hand tampers.

D. Care shall be taken in the use of mechanical tampers not to injure or move the pipe or to cause the pipe to be supported unevenly. Mechanical tampers shall not be used within one foot of the top of the pipe.

E. The backfill in the remainder of the excavation above the tamped backfill, or above the top of the screened gravel or sand envelope, if used, shall be placed in appropriate machine methods. Tamping will not be required in earth surface areas not subject to vehicular traffic. Backfilling or tamping with trenching machines is prohibited.

F. No large masses of backfilling material shall be dropped into the tamped layers of backfill until one foot of earth backfill has been placed over the top of the pipe.

G. Compaction by water jetting will not be permitted, unless specifically authorized by the ENGINEER.

H. Whatever method of compacting backfill is used, care shall be taken that stones and lumps shall not become nested and that all voids between stones shall be completely filled with fine material.

I. No compacting shall be done when the material is too wet to be compacted properly; at such times the compacting work shall be suspended until the previously placed materials have dried out sufficiently to permit proper compacting, or such other precautions shall be taken as necessary to obtain proper compacting.

J. All backfilled trenches in untraveled areas shall be thoroughly surface tamped with a kinetic energy tamping machine approved by the ENGINEER.

K. All backfilled trenches in traveled areas shall be compacted in conformance with Section 07130 – Select Fill Material, paragraph 3.2, compaction.

L. All backfilled trenches beneath roads, drives, walks or other improvements shall be compacted in nine (9") inch maximum loose lifts to greater than or equal to 95% minimum standard proctor density.

3.13 Excavated Material:

A. General

1. Excavated material shall be placed so as to minimize the inconvenience to occupants traveling on streets and driveways or adjoining properties. Excavated material shall not be deposited on private property unless written consent of the owner or owners thereof has been filed with the ENGINEER.

2. Suitable excavated material will be used as backfill, fill for embankments, or other parts of the work in accordance with the appropriate sections of the Specifications as directed by the ENGINEER.

3. Surplus excavated material, if any, shall be disposed of by the CONTRACTOR in a legal and environmentally sound area.

B. Clean Up and Restoration of Work Site

1. Upon completion of the backfilling, the streets or property shall be cleaned, surplus material removed, and the surfaces restored to the condition existing before ground was broken. If the CONTRACTOR fails to promptly remove such surplus material, the ENGINEER may have the same done, and charge the cost thereof as money paid to the CONTRACTOR.

2. Material excavated from private property shall be disposed of by the CONTRACTOR at his own expense. If the CONTRACTOR fails to remove such surplus material, the ENGINEER may have the same done, and charge the cost thereof as money paid to the CONTRACTOR.

3.14 Borrow: Should material excavated under the work of this contract be unsuitable or of insufficient quantity for completion of the necessary backfilling operations, the CONTRACTOR shall furnish approved backfill material.

PART 4 - MEASUREMENT AND PAYMENT (NOT USED)

- END OF SECTION -

SECTION 07160

TEST PITS

PART 1 - GENERAL

1.1 Scope: This Section covers all operations necessary to dig test pits in order to determine the exact location of existing utilities.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION

3.1 Test Pits: Test pits for the purpose of locating existing utilities shall be excavated in advance of the Work and backfilled by the CONTRACTOR. Test pits shall be backfilled immediately after their purpose has been satisfied and maintained in a manner satisfactory to the ENGINEER. Backfill shall comply with Section 07150 - Excavation, Backfill and Compaction of Utility Trenches. The minimum number of test pits to be excavated shall be as required by the CONTRACTOR and/or as directed by the ENGINEER.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Test Pits:

A. Measurement: Test pits, including all work, labor, materials, tools, equipment and incidentals, required to complete the item, as specified herein, and/or as directed by the ENGINEER, will be measured per Each.

B. Payment: Test pits, measured as provided above, will be paid at the Contract unit price per Each.

C. Pay Item:

Test Pits (07160)(01) per Each

- END OF SECTION -

SECTION 07170

BORING AND JACKING – CASING, PIPE AND SERVICE TUBING

PART 1 - GENERAL

1.1 Scope: This Section covers the installation of steel casing, gravity pipe and pressure pipe by boring and jacking. This Section also covers the installation of polyethylene pipe by horizontal directional boring. This Section also covers the installation of polyethylene service tubing by piercing.

1.2 General Requirements: Boring and jacking and/or piercing or utility mains, services and casing, shall be performed in order to avoid extensive surface restoration and to conform to State Highway or railway regulations. Generally, all boring and jacking and/or piercing of pipe or service tubing will be performed without casing, except where directed by the ENGINEER or as required by the State Highway Department or railway company.

1.3 Contractor Qualifications: The CONTRACTOR shall be fully equipped and experienced in the installation of pipe by the boring and jacking methods, both with and without casing.

1.4 Miscellaneous Requirements:

A. Those persons conducting the boring and jacking operations shall be responsible for determining the location, elevation and extent of all utilities, underground structures and/or obstructions in the vicinity of the installation.

B. When installing gravity sewer pipe with casings, the casings shall be completed before any adjacent sewer pipe has been laid from either the preceding or following manhole to the casing unless specifically directed otherwise by the ENGINEER.

C. Gravity sewer pipe installed by boring and jacking or installed in casings shall be installed to the elevations, lines and grades as directed.

1.5 Submittals: Submittals shall be provided in accordance with Section 03340 - SHOP DRAWINGS, SAMPLES AND PROJECT DATA.

PART 2 - PRODUCTS

2.1 Casings: Casing pipe shall be steel Grade 2 ASTM A252 seamless standard or electric weld pipe with minimum yield strength of 35,000 psi. The minimum wall thickness of the steel casing shall be 0.25" (1/4"). The pipe shall have an external coating of asphaltic tar. No internal coating will be required.

A. The casing pipe shall have an inside diameter of no less than 2" greater than the largest outside diameter of the carrier pipe, when the carrier pipe is less the 6" in diameter.

B. The casing pipe shall have an inside diameter of no less than 4" greater than the largest outside diameter of the carrier pipe, when the carrier pipe is 6" in diameter or greater.

2.2 End Seals: Casing end seals shall be flexible S-shaped, specially compounded synthetic rubber end seals with stainless steel bands and clamps. The casing end seals shall be Model AM as manufactured by Advance Products & Systems, Inc. or approved equal.

2.3 Casing Spacers: Casing spacers shall be constructed of fusion coated steel bands, ribbed inner liner, stainless steel hardware and glass reinforced runners. The casing spacers shall be Model SI as manufactured by Advance Products & Systems, Inc. or approved equal.

PART 3 - EXECUTION

3.1 General:

A. The work shall be conducted in such a manner as to safeguard property and minimize interference with highway and other operations.

B. Methods, scheduling and safety procedures shall be in accord with the permit from the regulatory authority or owner of the facility being crossed.

C. All methods of boring, jacking and/or piercing operations under State Highways, Parish Roads and/or Railways shall be subject to final approval by the respective agency.

3.2 Installation of Casing and/or Pipe by Conventional Boring and Jacking:

A. When practical, the boring operation shall start in a tight sheeted pit or trench, located at the lower end of the line.

B. The hole shall be mechanically bored. Jetting and washing methods shall not be used. Boring shall be confined to the Drilling Mud Bore Method or the Dry Bore Method.

C. The Drilling Mud Bore Method shall be conducted as follows: The cut shall be made with an open type bit that leaves the cuttings in place. A gel-forming colloidal drilling fluid consisting of approximately 2.5% (by weight) of high grade carefully processed bentonite shall be used to consolidate the cuttings, seal the walls of the hole, and furnish lubrication for subsequent removal of cuttings and installation of the pipe or casing immediately thereafter. Field adjustment of the percentage of bentonite may be required to accommodate varying soil conditions. Immediately following the completion of the boring operation, the water pipe or casing shall be driven into the bored hole by hydraulic jacks. (The Drilling Mud Bore Method will not be permitted for boring beneath railroads).

D. The Dry Bore Method shall be conducted as follows: The hole shall be mechanically bored. While the earth is removed automatically by the boring device, the pipe or casing shall be jacked into the soil ahead of the boring device. During the boring and jacking operation, the pipe or casing shall be driven ahead of the auger to prevent material from falling, flowing or sliding into the opening of the pipe or casing so as to

avoid undermining of pavement or underground structures. (The Dry Bore Method must be used when boring beneath railroads).

E. The casing or pipe shall be installed in the bored hole immediately after the hole is completed.

F. Adequate provisions shall be made to withstand the reaction of the jacks. Once started, the operation of boring and jacking, and installing the casing and/or pipe shall proceed as rapidly as possible. During non-working hours, adequate protection shall be used at the heading and the portal shall be closed.

G. Overcutting of the hole in excess of one (1") inch over the O.D. of the pipe or casing shall be remedied by pressure grouting the entire length of the installation.

H. Steel casing shall be butt welded by certified welders and all welds shall be full penetration single butt welds in accordance with API Standard 1104.

I. The pipe and/or casing shall be installed in the bored hole in such a manner that the pipe and joints will not be subjected to damaging compression loads. Push-on and mechanical joints shall not be subjected to any tension during or after installation.

J. Non-corrosive metallic locator wire shall be carefully attached to the pipe with duct tape at five (5') foot intervals prior to being installed in the bore.

K. A properly designed and fitted cap or plug shall be used to close and seal the ends of the pipe and/or casing against mud or water during installation.

3.3 Installation of Carrier Pipe Through Casing:

A. Following the installation of the casing, the carrier pipe shall be assembled and jacked or pulled through the casing. Push-on and mechanical joints shall not be subjected to any tension during or after installation. The carrier pipe installed in the casing will be paid for under a separate pipe pay item.

B. Non-corrosive metallic locator wire shall be carefully attached to the carrier pipe with duct tape at five (5') foot intervals prior to being installed in the casing.

C. The ends of the casing shall be sealed. The end seals shall be as detailed on the Drawings.

D. Casing spacers shall be installed on the carrier pipe prior to installation of carrier pipe into the casing.

E. Carrier pipes with joints inside the casing shall be installed with joint retainers at every joint.

3.4 Installation of Polyethylene Pipe by Directional Boring:

A. Directional boring shall be accomplished by use of remotely controlled, steerable, guided boring equipment. Line and grade shall be controlled by a guidance system that

relates the actual position of the boring equipment to the design position, both horizontally and vertically. Tolerance of two (2) inches for line and one and one half (1½) inches for grade shall not be exceeded. Active steering information shall be monitored and transmitted to the operation console.

B. Directional boring techniques involve establishing a pilot hole to the design grade and location and simultaneously back-reaming the pilot hole while pulling the water pipe through the established hole. Back-reaming shall be conducted to increase the diameter of the pilot hole while using bentonite clay fluid to stabilize the hole and facilitate installation of the pipe. The simultaneous pull-back operation involves pulling the pipeline length back through the drilling mud along the reamed hole pathway. The diameter of the reamer shall be no greater than a factor of 1.33 times the outside diameter of the pipe.

C. Axial tension force readings and torque readings shall be monitored. Pull back speed rates of 2 feet per minute shall not be exceeded.

D. Non-corrosive metallic locator wire shall be carefully attached to the pipe with duct tape at five (5') foot intervals prior to being installed in the bore.

E. The pipe should be cut to length only after, it is in thermal equilibrium with the surrounding soil (usually overnight). To accommodate any potential contraction, the pipe shall be pulled out an extra 4% (4 feet per 100 feet) to insure the pipe ends remain extended beyond the design point.

F. In order to provide for stress relief and thermal adjustment, no connections to the pipe shall be accomplished until a period of 0.25 hours per L.F. of pipe (or no less than 24 hours) has expired after successful completion of the installation.

G. Upon completion of the pipe installation and connection to adjacent pipe systems, backfilling and compaction shall be completed in accordance with Section 07150 - Excavation, Backfill and Compaction of Trenches.

3.5 Installation of Polyethylene Service Tubing by Underground Piercing:

A. Underground piercing shall be accomplished by use of pneumatically powered underground piercing equipment.

B. The hole shall be created by use of a pneumatically powered piercing tool. Jetting and washing methods shall not be used. Line and grade shall be established by use of a starting cradle for the piercing tool which establishes line and grade for the route. The piercing operation shall start in a tight sheeted pit or trench, located at the lower end of the line.

C. Underground piercing techniques involve establishing a hole to the design grade and location then simultaneously retrieving the piercing tool while pulling the polyethylene service tubing through the established hole. The simultaneous pull-back operation involves pulling the pipeline length along the pierced pathway. The diameter of the piercing tool shall be no greater than a factor of 1.33 times the outside diameter of the polyethylene service tubing.

D. A properly designed and fitted cap or plug shall be used to close and seal the ends of the polyethylene service tubing against mud or water during installation.

E. Non-corrosive metallic locator wire shall be carefully attached to polyethylene service tubing with duct tape at five (5') foot intervals prior to being installed in the hole.

F. Once started, the piercing operation and installing the polyethylene service tubing shall proceed as rapidly as possible. During non-working hours, adequate protection shall be used and the heading and the portal shall be closed.

G. The polyethylene service tubing should be cut to length only after, it is in thermal equilibrium with the surrounding soil (usually overnight). To accommodate any potential contraction the pipe shall be pulled out an extra 4% (4 feet per 100 feet) to insure the pipe ends remain extended beyond the design point.

H. In order to provide for stress relief and thermal adjustment, no connections to polyethylene service tubing shall be accomplished until a period of 0.25 hours per L.F. of polyethylene service tubing (or no less than 24 hours) has expired after successful completion of the installation.

I. Upon completion of the installation and connection to adjacent pipe systems, backfilling and compaction shall be completed in accordance with Section 05150 - Excavation, Backfill and Compaction of Trenches.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Install Pipe by Boring and Jacking: (Refer to Section 04120 – Water Distribution System and Related Appurtenances.

- END OF SECTION -

SECTION 07190

SHEETING AND BRACING

PART 1 - GENERAL

1.1 Scope: The CONTRACTOR shall furnish shoring and sheeting and bracing as required for safety to protect existing structures and for the construction of new work.

PART 2 - PRODUCTS

2.1 Wood: Wood for shoring and sheeting shall be green, rough cut hardwood planking.

2.2 Steel: Steel interlocking sheet piling of suitable design section and length for intended purposes.

PART 3 - EXECUTION

3.1 Installation:

A. The CONTRACTOR shall furnish, install, and maintain such sheeting and bracing as may be required to support the sides of excavations, to prevent any movement which could in any way diminish the volume of the excavation to less than that which is necessary for proper construction, and to protect adjacent structures from undermining or other damage. If the ENGINEER is of the opinion that sufficient or proper supports have not been provided, he may order additional supports be installed. Compliance with such order shall not relieve or release the CONTRACTOR from his responsibility for the sufficiency of such supports. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and rammed.

B. The CONTRACTOR, as requested by the ENGINEER, shall leave in place to be embedded in the backfill, all sheeting, bracing, and other related items as may be required. The ENGINEER may direct that timber used for sheeting and bracing be cut off at any specified elevation but in no case shall be left higher than three (3) feet below grade. No separate payment will be made for cutting sheeting and bracing below grade.

C. All sheeting and bracing not left in place shall be carefully removed in such manner as not to endanger the construction or the structures, utilities, or property. No separate payment will be made for removing sheeting and bracing.

D. The right of the ENGINEER to order sheeting and bracing left in place shall not be construed as creating an obligation on his part to issue such orders, and his failure to exercise his right to do so shall not relieve the CONTRACTOR from liability for damages to persons, or property occurring from or upon the work occasioned by negligence or otherwise, growing out of a failure on the part of the CONTRACTOR to install and/or

leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.

E. The CONTRACTOR shall receive no payment, other than that included in the bid price for pipe, for any timber used for sheeting, bracing, or other related items installed at his convenience and/or used in the normal course of trench installation/construction. Contractor shall receive separate payment only for that sheeting and bracing left in place where specifically ordered or authorized by the ENGINEER. All other such sheeting and bracing will be included in the price bid for the respective work.

PART 4 - MEASUREMENT AND PAYMENT

4.1.1 Sheeting and Bracing:

A. Measurement: Sheeting and bracing including excavation, leaving in-place, removal or cutting below grade and including all work, labor, materials, tools, equipment and incidentals by the ENGINEER will be measured by the thousand board feet (12" x 12" x 1") installed, accepted, left in-place, removed or cut below grade. Sheeting and bracing used for the CONTRACTOR's convenience will not be measured for payment.

B. Payment: Sheeting and bracing, measured as provided above, will be paid at the Contract unit price per thousand board feet (MBF).

C. Pay Item: Sheeting and Bracing (07190)(01) per MBF.

- END OF SECTION -

SECTION 07210

AGGREGATE SURFACE REPAIR

PART 1 - GENERAL

1.1 Scope: The CONTRACTOR shall furnish all labor, materials, tools and equipment and perform operations necessary for construction of aggregate surfaces repairs in accordance with these Specifications and in conformity with the lines and grades as established by the ENGINEER.

1.2 Reference Standard: Work shall conform to the following Section of the State of Louisiana, Department of Transportation and Development, "Louisiana Standard Specifications for Roads and Bridges", 2016 Edition, except as may be modified herein:

Section 203	-	Excavation and Embankment
Section 302	-	Class II Base Course
Section 401	-	Aggregate Surface Course
Section 1003	-	Aggregates

All references made therein to measurement and payment are deleted.

1.3 Submittals: Submit product data in accordance with provisions of Section 03340 -Shop Drawings, Samples and Project Data.

PART 2 - PRODUCTS

2.1 Backfill: Refer to Section 07150 – Excavation, Backfill and Compaction of Utility Trenches.

2.2 Base Course: Base course shall be select fill conforming to Section 07130 – Select Fill Material. (Crushed stone base course for pavement replacement or otherwise directed shall conform to Paragraph 2.3 of this Section.)

2.3 Surface Course: Surface Course shall be "Dense Grade Aggregate" (DGA); Crushed Stone; or Recycled P.C.C. Pavement. Refer to 1003.05.1 of the referenced Standard. (Crushed stone base course for pavement replacement or otherwise directed shall conform to this paragraph.)

2.4 Geogrid: (NOT REQUIRED THIS PROJECT) Triaxial supported reinforced pre-punched polypropylene triangular gridded structural sheeting equivalent in strength (SN) to two (2) inches of the design base course material exposed to an H-20 live load. The geogrid shall be manufactured from pre-punched polypropylene sheets oriented in three substantial equilateral directions resulting in "ribs" of high molecular orientation continuous through the mass. Geogrid sheets shall come in rolls of 13.1 feet x 246 feet long.

2.5 Capillary Barrier: (NOT REQUIRED THIS PROJECT) Crushed stone in conformance with Paragraph 2.2 herein.

2.6 DGA Trench Backfill: Refer to paragraph 2.3 of this Section.

PART 3 - EXECUTION

3.1 General: All work related to this Section shall conform to applicable provisions of the referenced specification except as amended herein.

3.2 Base Course: The installation of the base course shall conform to the applicable subsections of the Referenced Standard. Base course shall be six (6") inch thick. Compaction shall be in accordance with Paragraph 302.07.3 of the referenced Standard. Minimum compaction shall be 98% of standard proctor density within two (2%) percent optimum moisture content.

3.3 Surface Course: The installation of the surface course shall conform to the applicable subsections of the Referenced Standard. The Contractor shall construct all surface course to the lines, depth and grades as directed. Surface course shall be a minimum of three (3") inches compacted thickness. The surface course shall be placed, shaped and compacted in accordance with Section 401 of the referenced Standard. The surface shall be rolled and shall be tight and smooth.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Aggregate Surface Repair:

A. Measurement: Aggregate Surface Repair including crushed stone surface and select fill base course and including all work, labor, material, tools, equipment, lawful and contracted requirements, and incidental times required complete the Bid Item, as specified herein and/or as directed by the ENGINEER, will be measured per square yard installed and accepted.

B. Payment: Aggregate Surface Repair, measured as provided above, will be paid at the Contract unit price per measured Square Yard, installed and accepted.

C. Pay Item: Aggregate Surface Repair; (07210)(01) per Square Yard.

4.2 Crushed Stone Base Course:

A. Measurement: Crushed stone base course, including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and/or as directed by the ENGINEER, and measured by the Cubic Yard (Vehicular Measure) installed and accepted.

B. Payment: Crushed stone base course, measured as provided above, will be paid at the Contract unit price per Cubic Yard (Vehicular Measure) for which payment shall

provide for complete compensation for the work as measured above, installed in conformance with Contract Documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices. (Traffic Control Paid Elsewhere)

C. Pay Item:

Crushed Stone Base Course (Vehicular Measurement) (07210)(02) per Cubic Yard

4.3 DGA Trench Backfill:

A. Measurement: DGA trench backfill, including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and/or as directed by the ENGINEER, and measured by the Cubic Yard (Vehicular Measure) installed and accepted.

B. Payment: DGA trench backfill, measured as provided above, will be paid at the Contract unit price per Cubic Yard (Vehicular Measure) for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract Documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices. (Traffic Control Paid Elsewhere)

C. Pay Item:

DGA Trench Backfill (Vehicular Measurement) (07210)(03) per Cubic Yard

- END OF SECTION -

SECTION 07220

TRAFFIC MAINTENANCE AGGREGATE

PART 1 - GENERAL

1.1 Scope: This Section covers the installation of traffic maintenance aggregate in this project as a temporary material to allow for vehicular traffic through the construction project.

1.2 Referenced Standard: Conform to the following sections of the State of Louisiana, Department of Transportation and Development, Standard Specifications for Roads and Bridges, 2016 Edition, except as modified herein:

Section 402 - Traffic Maintenance Surfacing
Section 1003.05.1 – Stone, Recycled Portland Cement Concrete

Delete all reference to Measurement and Payment made by the referenced standard.

1.3 Submittals: Submittals shall include a sample of the material to be installed if requested by the ENGINEER and shall be provided in accordance with Section 07340 - Shop Drawings, Samples and Project Data.

PART 2 - PRODUCTS

2.1 Traffic Maintenance Aggregate: The surface course shall conform to Section 1003.05.1 of the above referenced Standard.

PART 3 - EXECUTION

3.1 General:

A. All work shall conform to the referenced publications and these Specifications.

B. When the aggregate is no longer required and the permanent repairs to the pavement are ready to be performed, the aggregate shall be removed from the project area.

C. All aggregate shall be placed on compacted material and be checked by the CONTRACTOR for proper compaction throughout its use at those locations.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Traffic Maintenance Aggregate:

A. Measurement: Traffic Maintenance Aggregate satisfactorily installed and accepted as specified or as directed, will be measured by the cubic yard in approved hauling vehicles at the point of delivery.

B. Payment: Traffic Maintenance Aggregate in place and accepted, measured as provided above, will be paid at the Contract unit price per cubic yard which price and payment shall constitute full compensation for furnishing all materials, equipment, tools, labor, hauling, traffic control, signs, barricades, safety items, and incidentals necessary to complete this item in accordance with the Specifications.

C. Pay Item: Traffic Maintenance Aggregate (Vehicular Measurement); (07220)(01) per Cubic Yard.

- END OF SECTION -

SECTION 07220

TRAFFIC MAINTENANCE AGGREGATE

PART 1 - GENERAL

1.1 Scope: This Section covers the installation of traffic maintenance aggregate in this project as a temporary material to allow for vehicular traffic through the construction project.

1.2 Referenced Standard: Conform to the following sections of the State of Louisiana, Department of Transportation and Development, Standard Specifications for Roads and Bridges, 2016 Edition, except as modified herein:

Section 402 - Traffic Maintenance Surfacing
Section 1003.05.1 – Stone, Recycled Portland Cement Concrete

Delete all reference to Measurement and Payment made by the referenced standard.

1.3 Submittals: Submittals shall include a sample of the material to be installed if requested by the ENGINEER and shall be provided in accordance with Section 07340 - Shop Drawings, Samples and Project Data.

PART 2 - PRODUCTS

2.1 Traffic Maintenance Aggregate: The surface course shall conform to Section 1003.05.1 of the above referenced Standard.

PART 3 - EXECUTION

3.1 General:

A. All work shall conform to the referenced publications and these Specifications.

B. When the aggregate is no longer required and the permanent repairs to the pavement are ready to be performed, the aggregate shall be removed from the project area.

C. All aggregate shall be placed on compacted material and be checked by the CONTRACTOR for proper compaction throughout its use at those locations.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Traffic Maintenance Aggregate:

A. Measurement: Traffic Maintenance Aggregate satisfactorily installed and accepted as specified or as directed, will be measured by the cubic yard in approved hauling vehicles at the point of delivery.

B. Payment: Traffic Maintenance Aggregate in place and accepted, measured as provided above, will be paid at the Contract unit price per cubic yard which price and payment shall constitute full compensation for furnishing all materials, equipment, tools, labor, hauling, traffic control, signs, barricades, safety items, and incidentals necessary to complete this item in accordance with the Specifications.

C. Pay Item: Traffic Maintenance Aggregate (Vehicular Measurement); (07220)(01) per Cubic Yard.

- END OF SECTION -

SECTION 07230

DEWATERING

PART 1 - GENERAL

1.1 Scope: This Section covers all work required to install and maintain drainage systems for handling groundwater and surface water encountered during construction of the project.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 Dewatering:

A. The CONTRACTOR shall, at all times during construction, provide and maintain proper equipment and facilities to promptly remove and dispose of all water entering excavations and keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition, until the fill, structure, or pipes to be built thereon or otherwise damaged by allowing water levels to return to natural elevations.

B. Dewatering shall at all times be conducted in such a manner as to preserve the natural undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.

C. The CONTRACTOR shall furnish all materials and equipment and perform all work required to install and maintain the drainage systems he proposes for handling groundwater and surface water encountered during construction of structures, pipelines, and compacted fills.

D. The established calendar day period for time of completion is intended to allow the CONTRACTOR to take advantage of the seasonal variations and groundwater levels during construction.

E. Any dewatering methods must meet the approval of the ENGINEER.

PART 4 - MEASUREMENT AND PAYMENT (NOT USED)

- END OF SECTION -

SECTION 07240

STREET PAVEMENT REPLACEMENT AND PATCHING

PART 1 - GENERAL

1.1 Scope: This Section covers the replacement and/or patching of public asphaltic concrete or Portland Cement concrete streets or roadways which were damaged as a result of trenching or installation operations in accordance with these Specification and in conformity with the lines and grades established by the ENGINEER. Demolition and removal measured and paid elsewhere.

1.2 Submittals: Submit product data in accordance with provisions of Section 03340 -Shop Drawings, Samples and Project Data.

1.3 Applicable Publication: The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.

A. American Society for Testing and Material (ASTM) Publications:

D994 Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)

B. American Association of State Highway and Transportation Officials (ASSHTO) Publication:

M148 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete

1.4 Work Not Listed: Removal and replacement of paving for the convenience of the CONTRACTOR will not be considered for payment.

1.5 Referenced Standard: Conform to the following sections of the State of Louisiana, Department of Transportation and Development, Standard Specifications for Roads and Bridges, 2016 Edition, except as modified herein:

Section 202 - Removing or Relocating Structures and Obstructions
Section 301 - Class I Base Course
Section 502 - Asphalt Concrete Mixtures
Section 503 - Asphaltic Concrete Equipment and Processes
Section 504 - Asphalt Tack Coat
Section 505 - Asphalt Prime Coat
Section 510 - Asphaltic Concrete Pavement Patching, Widening and Joint Repair
Section 601 - Portland Cement Concrete Pavement
Section 901 - Portland Cement Concrete
Section 1003 - Aggregates

(All references made therein to measurement and payment are deleted.)

PART 2 - PRODUCTS

2.1 Base Course for Asphaltic Concrete Repairs (Local Streets):

A. Portland Cement Concrete Base Course for Asphaltic Concrete Repairs: Refer to Section 07330 – Cast-In-Place Concrete.

B. Aggregate Base Course for Asphaltic Concrete Repairs: Refer to Section 07210 – Aggregate Surface Course, paragraph 2.3, Surface Course

2.2 Asphaltic Concrete: Asphaltic concrete shall comply with Section 502 – Asphalt Concrete Mixture of the reference standard.

2.3 Asphalt Tack Coat: Asphalt tack coat shall comply with Section 504 - Asphalt Tack Coat of the reference standard.

2.4 Asphalt Prime Coat: This material shall conform to Section 505 - "Asphalt Prime Coat" of the Referenced Standard.

2.5 Select Fill Material: Refer to Specification Section 07130 - Select Fill Material.

2.6 Backfill Material (Paved Areas): Refer to Section 07130 – Select Fill Material.

2.7 Curing Compound for Concrete Base Course and Portland Cement Concrete Pavement: This material shall conform to AASHTO Designation M148 and be on the LDOTD Qualified Products list. The curing compound shall be white pigmented.

2.8 Joint Filler: Joint material shall be either bituminous type or wood. Bituminous type shall consist of bituminous (asphalt or tar) mastic composition found and encased between two (2) layers of bituminous unpregnated felt and conform to ASTM Designation D994. Wood type shall be clear heart redwood.

2.9 Joint Sealant: Material for sealing of joints in replaced portland cement concrete pavement shall be either hot pour rubber asphalt sealer equal to #164 Sealtight Hot Pour Rubber Asphalt as manufactured by W.R. Meadows, Crafco of Chandler, AZ, or approved equal, or cold applied low modulus sealant equal to "Sof-Seal" Sealtight as manufactured by W.R. Meadows, Dow Corning, or approved equal.

2.10 Fiber Reinforcement: All concrete pavement shall be reinforced with the use of collated, fibrillated polypropylene fibers as manufactured by Fibermesh Co. Of Chattanooga, Tennessee, Nycon of Westerly, RI, or approved equal. The fibers shall be used at a rate of one and one half pounds (1 ½ lbs.) per cubic yard and in strict accordance with the manufacturer's recommendations. The fiber manufacturer or approved distributor shall provide the services of a qualified technician at job startup.

2.11 "Black" Dye Concrete Admixture: Admixture shall be "Black" dye concrete admixture as manufactured by Davis Corning and supplied by Louisiana Industries, Lam Construction Chemical, or approved equal.

PART 3 - EXECUTION

3.1 General: Damages to existing paved streets caused by the construction of the utility shall be repaired by the CONTRACTOR. Such repairs shall be made without any needless delay and in the best workmanlike manner. The underlying foundation courses as well as the finished surface shall conform to the requirements of these Specifications. In no case shall the thickness of base and surface materials be less than existing pavement. All existing paved surfaces shall be saw cut as to form a neat and straight edge prior to placement of the new surface.

3.2 Notification of ENGINEER: The ENGINEER shall be notified at least 24 hours prior to any schedule pour concrete. Unless directions are given by the ENGINEER to the contrary, no concrete pour shall be made without an inspection by the ENGINEER.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Surface Repairs:

A. Measurement: Surface Repairs satisfactorily completed and accepted as Specified, or as Directed, shall be measured by the Square Yard of surface replaced.

B. Payment: Surface Repair in place and accepted, measured as provided above, will be paid at the Contract unit price per Square Yard, which price and payment shall constitute full compensation for furnishing all materials, equipment, tools, labor, hauling, and incidentals necessary to complete this item in accord with the Specifications. (Separate Asphaltic Concrete with Prime Coat will be Measured and Paid by the Ton)

C. Pay Item:

Asphaltic Concrete with Prime Coat (07240)(01) per Ton

Replacement of P.C.C. Sidewalk or Driveway (6" Th.) (07240)(02) per Square Yard

Replacement of P.C.C. Sidewalk or Driveway (4" Th.) (07240)(03) per Square Yard

Replacement of 8" Th. P.C.C. Street with 12" Th. DGA Base Over Amoco 2002 Paving Fabric (07240)(04) per Square Yard

Replacement of 6" Th. P.C.C. Street with 10" Th. DGA Base Over Amoco 2002 Paving Fabric (07240)(05) per Square Yard

Replacement of 4" Th. Asphaltic Concrete with 12" Th. DGA Base Over Amoco 2002 Paving Fabric (4" Th. 2 Lifts) (07240)(06) per Square Yard

Replacement of 2" Th. Asphaltic Concrete with 10" Th. DGA Base Over Amoco 2002 Paving Fabric (07240)(07) per Square Yard

- END OF SECTION -

SECTION 07250

FENCES

PART 1 - GENERAL

1.1 Scope: This Section covers the furnishings of all labor, materials, tools and equipment, and performing all operations necessary to install fencing as directed by the ENGINEER.

1.2 General: The CONTRACTOR shall not be compensated for fence removal and replacement conducted at the CONTRACTOR'S option to accommodate construction. The CONTRACTOR shall not be compensated for removal and replacement of fence which was damaged by the CONTRACTOR. Fence damaged by the CONTRACTOR and not scheduled to be removed and replaced under the Contract, shall be removed from the project and a fence of equal quality, workmanship and design shall be installed in its place at no separate pay.

1.3 Referenced Standard: Work shall conform to the following Sections of the State of Louisiana, Department of Transportation and Development, "Louisiana Standard Specifications for Roads and Bridges", 2016 Edition, except as may be modified herein:

(1)	Fences	705
(2)	Portland Cement Concrete	901
(3)	Fence and Guard Rail	1010
(4)	Timber, Timber Connectors & Preservatives	1014
(5)	Miscellaneous Materials	1018

All references made therein to measurement and payment are deleted.

1.3 Submittals: Submittals shall be provided in accordance with Section 03340 – Shop Drawings, Samples and Project Data.

PART 2 - PRODUCTS

2.1 Chain Link Fence and Gates:

A. Fabric: Fabric shall be woven in two (2) mesh from No. 9 gauge heavily galvanized wire. The height of the fence fabric shall be forty-eight (48") inches or sixty (60") inches. The chainlink fence fabric shall be galvanized after weaving.

B. Line Posts: Line posts shall be two and three-eighths (2 3/8") inch outside diameter and weigh 3.65 lb. per linear foot.

C. End, Corner and Pull Posts: End, corner and pull posts shall be two and seven-four (4") inch outside diameter and weigh 9.10 lb. per linear foot.

D. Top Rails and Intermediate Rails: Top rails and intermediate rails shall be one and five-eighths (1 5/8") inch outside diameter and weigh 2.27 lb. per linear foot.

E. Brace Rails: Brace rails shall be two and seven-eighths (2 7/8") inches outside diameter and weigh 5.79 lb. per linear foot.

F. Gate posts: Gate posts shall be four (4") inches outside diameter and weigh 9.10 lb. per linear foot.

G. Post Caps: Steel pipe posts shall be capped with caps of the manufacturer's standard material, as approved; posts shall have arms projecting outward and formed with tongues or other approved means for attachment of the barbed wire.

H. Padlock: A heavy brass or bronze padlock shall be furnished with each gate. The padlocks shall be equal to locks manufactured by Yale and Towne, Corbin, or approved equal and shall have two (2) keys per each lock installed.

I. Galvanizing: Material used in the fence construction, shall be galvanized with a heavy coating (not less than two ounces per square foot of surface) of zinc smelter using the hot dip process. The surface areas of tubular steel shall be the area of both inside and outside surfaces.

J. Ground Rods: 5/8" nominal diameter x eight (8') foot long Copperweld rod, Burndy type GAR.

2.2 Barbed Wire Fence and Gates:

A. Barbed Wire: Barbed wire shall consist of three (3) strands of 12 ½ gauge wire with four (4) round or half round barbs spaced five (5") inches apart. Wire shall be steel in accordance with ASTM A 121.

B. Treated Timber Posts and Braces: Posts shall be round. Braces shall be round or square. Treated timber posts and braces shall be in accordance with Section 1014 of the referenced standard.

C. Steel Posts and Braces: Steel posts and braces shall be equipped with corrugations, knobs, notches, holes or studs so placed and constructed as to engage a substantial number of fence wires in proper position. Posts may be punched with holes in such position and of such size as will not unduly impair the strength of the posts. Posts with punched tabs used for fastening wires are not acceptable. Corner, end and bracing posts shall be supplied with necessary holes and with galvanized bolts of standard commercial quality or other satisfactory substitute, such as castings, for fastening braces to the posts. Line posts, anchor plates and braces shall comply with ASTM A 702, except that a hardness test may not be substituted for the tensile test. Steel posts, anchor plates and braces shall be galvanized in accordance with ASTM A123.

D. Staples and Nails: Staples and nails shall be made of galvanized steel wire. Minimum galvanized coating shall be not less than 0.20 ounce per square foot when tested in accordance with ASTM A 90.

E. Metal Fasteners for Steel Posts: Metal fasteners for steel posts shall be galvanized

steel-wire fasteners or clamps and shall be satisfactory for use with the type of steel post furnished. Wire shall not be less than 0.120 inch diameter. Galvanized coating shall not be less than 0.20 once per square foot when tested in accordance with ASTM A 90.

F. Gates: Steel used in fabricating gates shall be galvanized in accordance with ASTM A 653 Coating Designation G60 (A653M Coating Designation Z180).

G. Gate Posts: Treated timber posts shall comply with Section 1014 of the Referenced standard. Metals posts shall be made of galvanized steel pipe, standard weight, complying with ASTM A 53.

H. Gate Hardware: Hinges, washers, nails, staples, welded chains and latches shall be galvanized, of acceptable quality, and of satisfactory type for use with the gate and posts selected.

2.3 Wood Fence and Gates

A. Wood Pickets: Vertical timber pickets shall be standard one inch by six inches by six feet (1"x6"x 6') number 2 grade "DOG EARED" cedar pickets.

B. Wood Runners: Horizontal wood runners for wood fence shall be standard two inch by four inch by ten feet (2"x4"x10') number 2 grade pressure treated timber. The degree of treatment shall be equal to "Penta" 0.25.

C. Line Posts: Line posts shall be two and three-eighths (2 3/8") inch outside diameter and weigh 3.65 lb. per linear foot.

D. End and Corner Posts: End and corner posts shall be four (4") inch outside diameter and weigh 9.10 per linear foot.

E. Post Caps: Steel pipe posts shall be capped with caps of the manufacturer's standard material, as approved.

F. Screws: Fasteners for attaching pickets to runner shall be standard galvanized steel self sinking two and one quarter (2 1/4") inch long wood screws. Two (2) required each picket at each runner.

G. Galvanizing: Ferrous material used in the fence construction, shall be galvanized with a heavy coating (not less than two ounces per square foot of surface) of zinc smelter using the hot dip process. The surface areas of tubular steel shall be the area of both inside and outside surfaces.

H. Padlock: A heavy brass or bronze padlock with a shackle chain shall be furnished with each gate. The padlock shall be equal to locks manufactured by Yale and Towne, Corbin, or approved equal and shall have two (2) keys per each lock installed.

2.4 Woven Wire Fence and Gates:

A. Woven Wire: Woven wire shall comply with Subsection 1010.2 of the referenced Standard.

B. Posts and Braces: Posts and braces shall be either steel or treated timber in accordance with Subsection 1010.03.2 and 1010.10.2 of the referenced Standard.

C. Gates: Gates shall be in accordance with subsection 1010.06.1 of the referenced Standard.

D. Padlock: A heavy brass or bronze padlock with a shackle chain shall be furnished with each gate. The padlock shall be equal to locks manufactured by Yale and Towne, Corbin, or approved equal and shall have two (2) keys per each lock installed.

E. Galvanizing: All steel material used in gate construction, shall be galvanized in accordance with ASTM A525, G90, Coating Designation x 1.25 Commercial.

F. Ground Rods: Five-eighths (5/8") inch nominal diameter x eight (8') feet long Copperweld rod, Bundy type GAR.

2.5 Rebuilt Fence and Gates: The Contractor shall take down and rebuild existing fence utilizing existing fencing materials. Fence shall be rebuilt in the same manner as specified for new fence.

2.6 Concrete: Refer to Section 07330 – Cast-In-Place Concrete.

PART 3 - EXECUTION

3.1 Erection of Chain Link Fence and Gates:

A. The fences and gates shall be erected by skilled mechanics in accordance with the recommendations of the manufacturer.

B. The post shall be embedded as indicated on the Drawings. Posts shall be set in cast-in-place concrete at least nine (9") inches and no greater than one (1') foot in diameter and three (3') feet below grade. The top of the post bases shall be crowned to shed water or installed to grade.

C. Fabric shall be connected to line posts with No. 9 gauge wire clips every twelve (12") inches; to top rail with No. 9 gauge wire clips every twelve (12") inches; to terminal, corner and gate posts with one-fourth (1/4") inch by three-fourth (3/4") inch tension bars tied with No. 11 gauge one (1") inch wide steel bands and secured with three-eighth (3/8") inch diameter bolts and nuts every twelve (12") inches; and to tension wire with No. 11 gauge hog clips every twelve (12") inches.

D. The fence shall follow the contours of the ground as nearly as is practical.

E. Posts shall be spaced a maximum of ten (10') feet on centers.

F. Corner, gates and pull posts shall be braced as recommended by the manufacturer and as approved.

G. Two (2) grounding devices shall be installed at the project site. The devices shall be spaced a maximum of three hundred (300') feet on centers and at a minimum shall be installed on opposing diagonal corners of the new chain link fence.

3.2 Erection of Barbed Wire Fence and Gates:

A. The fences and gates shall be erected by skilled mechanics in accordance with the recommendations of the manufacturer.

B. The post shall be embedded as indicated on the Drawings.

C. Barbed wire shall be connected to line posts with No. 9 gauge wire clips every twelve (12") inches; to terminal, corner and gate posts with one-fourth (1/4") inch by three-fourth (3/4") inch tension bars tied with No. 11 gauge one (1") inch wide steel bands and secured with three-eighth (3/8") inch diameter bolts and nuts every twelve (12") inches; and to tension wire with No. 11 gauge hog clips every twelve (12") inches.

D. The fence shall follow the contours of the ground as nearly as is practical.

E. Posts shall be spaced a maximum of ten (10') feet on centers.

F. Corner, gates and pull posts shall be braced as recommended by the manufacturer and as approved.

G. Wood posts shall be placed with small end up. Tops of posts shall be set to required grade and alignment. Cutting of wood post tops will be allowed only when approved. Cut ends shall be treated with two (2) applications of the same type preservative used for post treatment. Wire shall be stretched taut.

3.3 Erection of Wood Fence and Gates:

A. The fences and gates shall be erected by skilled mechanics in accordance with the recommendations of the manufacturer. Posts shall be set in cast-in-place concrete. The top of the post bases shall be crowned to shed water or installed to grade.

B. The fence shall follow the contours of the ground as nearly as is practical.

C. Posts shall be spaced a maximum of eight (8') feet on centers.

D. Wood pickets shall be installed with a 1/8" gap-typical.

3.4 Erection of Woven Wire Fence:

A. The fences and gates shall be erected by skilled mechanics in accordance with the recommendations of the manufacturer. Posts shall be set in cast-in-place concrete at least

nine (9") inches and no greater than one (1') foot in diameter and three (3') feet below grade.

B. Wood posts shall be set small end up. The top of the post bases shall be crowned to shed water or installed to grade.

C. Woven wire shall be fastened to line posts with galvanized staples for wood posts and galvanized steel wire fasteners or clamps for metal posts.

D. The fence shall follow the contours of the ground as nearly as is practical.

E. Posts shall be spaced a maximum of ten (10') feet on centers.

F. Corner, gates and pull posts shall be adequately braced.

G. Ground rods shall be located and spaced along each segment of fence, at maximum five hundred (500') foot intervals.

3.5 Rebuilt Fence: When specified, the contractor shall take down, move back and rebuild existing fence. Fence shall be rebuilt in the same manner as specified for new fence. Rebuilt ornamental fence, picket fence or other special type fence shall be equal in all respects to existing fence.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Fence:

A. Measurement: Fence will be measured by the linear foot between outside of and posts for each continuous run of fence, including gates, post fence fabric, etc.

B. Payment: Fence, complete and accepted, measured as provided above, will be paid at the Contract unit price per linear foot, which price and payment shall constitute full compensation for furnishing all material, equipment, tools, labor, and incidentals necessary to complete this item in accordance with the Specifications.

C. Pay Items:

Four (4') Foot Chain Link Fence (07250)(01) per Linear Foot.

Five (5') Foot Chain Link Fence (07250)(02) per Linear Foot.

Six (6') Foot Chain Link Fence (07250)(03) per Linear Foot.

Four (4') Foot Wire Fence (07250)(04) per Linear Foot.

Five (5') Foot Wire Fence (07250)(05) per Linear Foot.

Six (6') Foot Wood Fence (07250)(06) per Linear Foot.

Eight (8') Foot Wood Fence (07250)(07) per Linear Foot.

4.2 Gates:

A. Measurement: Gates of the various types and sizes including all work, labor, materials, tools, equipment and incidentals required to complete the work will be measured per Each.

B. Payment: Gates, measured as provided above, will be paid at the Contract unit price per Each, installed and accepted.

C. Pay Items:

4' H. x 4' W. Chain Link Pedestrian Gate (07250)(08) per Each

5' H. x 5' W. Chain Link Pedestrian Gate (07250)(09) per Each

6' H. x 6' W. Chain Link Pedestrian Gate (07250)(10) per Each

6' H. x 6' W. Chain Link (Double Leaf 2 at 6' W. Each) Traffic Gate (07250)(11) per Each

5' H. x 6' W. Chain Link (Double Leaf 2 at 6' W. Each) Traffic Gate (07250)(12) per Each

5' H. x 5' W. Wood Fence Pedestrian Gate (07250)(13) per Each

6' H. x 6' W. Wood Fence Pedestrian Gate (07250)(14) per Each

6' H. x 6' W. Wood (Double Leaf 2 at 6' W. Each) Traffic Gate (07250)(15) per Each

8' H. x 6' W. Wood (Double Leaf 2 at 6' W. Each) Traffic Gate (07250)(16) per Each

- END OF SECTION -

SECTION 07270

TEMPORARY SIGNS, BARRICADES, AND BARRIERS

PART 1 - GENERAL

1.1 Scope: This Section covers minimum project construction signing, barricades, traffic control devices, other materials, and manpower required for proper routing, regulation, direction, and maintenance of vehicular traffic and pedestrian traffic during construction of the project.

1.2 Reference Standard:

A. Work shall conform to the following Section of the State of Louisiana, Department of Transportation and Development, "Louisiana Standard Specifications for Roads and Bridges", 2016 Edition, except as modified herein:

Section 713 - Temporary Traffic Control
Section 729 – Permanent Signs
Section 737 - Painted Traffic Striping
Section 1018 - Miscellaneous Materials

All references made therein to measurement and payment are hereby deleted.

B. Work shall conform to the United States Department of Transportation Federal Highway Administration Manual on Uniform Traffic Control Devices.

PART 2 - PRODUCTS

2.1 Temporary Signs, Barricades, Barriers and Pavement Markings: Refer to Section 713 - Temporary Traffic Control of the referenced Standard.

2.2 Painted Traffic Striping: Refer to the Referenced Standard Section 737 - Painted Traffic Striping and Section 1015.08 - Temporary Pavement Markings.

2.3 Signs: Refer to the Referenced Standard Section 729 - Permanent Signs and Section 1015.04.1 - Sign Panels.

2.4 Warning Lights: Refer to the Referenced Standard Section 1018.13 - Barricade Warning Lights.

PART 3 - EXECUTION

3.1 General:

A. The CONTRACTOR shall be responsible for providing safe and expeditious movement of traffic through construction zones. A construction zone is defined as the immediate areas of actual construction and all abutting areas which are used by the CONTRACTOR and which interfere with driving or walking public.

B. Remove temporary equipment and facilities when no longer required, restore area to original, or to specified conditions.

C. Portions of this project are located along heavily traveled streets. The CONTRACTOR is required to maintain at least one lane for traffic with barricades and flagmen at all times.

D. CONTRACTOR shall video document the condition of existing paved surfaces within the construction limits. Documentation may prevent pavement repairs at the CONTRACTOR'S expense. All paved surfaces damaged due to the CONTRACTOR'S operations will be replaced at the CONTRACTOR'S expense.

3.2 Signing Sequences: Signing sequence shall conform with the "Manual on Uniform Traffic Control Devices." These requirements shall be considered a minimum standard necessary to meet contractual obligations. Additional signs as may be necessary for the safety of the public and construction crews shall be the CONTRACTOR'S sole responsibility and shall not relieve him of any liability in connection thereof.

3.3 Traffic Control:

A. The necessary precautions shall include, but not be limited to, such items as proper construction warning signs, signals, lighting devices, markings, barricades, channelization, and hand signaling devices, radio's, walkie-talkies, etc.

B. The CONTRACTOR shall provide at least five (5) working days notification to the ENGINEER and to the applicable governing authority of the necessity to close any portion of a roadway carrying vehicles or pedestrians so that the final approval by the applicable governing authority can be obtained. At no time will more than one (1) lane of a roadway be closed to vehicles and pedestrians. With such closings, adequate provision shall be made for the safe expeditious movement of each.

C. The CONTRACTOR shall also be responsible for notifying Fire, Police and Ambulance Departments whenever roads are impassible at least 24 hours in advance of any closure.

D. The CONTRACTOR shall be responsible for removal, relocation, or replacement of any traffic control device in the construction area which exists as part of the normal preconstruction traffic control scheme.

E. The CONTRACTOR shall immediately notify the OWNER of any vehicular or pedestrian safety or efficiency problems incurred as a result of the construction of the project.

F. Construction signing, detours, and traffic control devices shall be in accordance with the Louisiana Manual of Uniform Traffic Control Devices.

G. The CONTRACTOR shall maintain pedestrian traffic with the use of plywood, handrails, temporary steps, etc. as required to safely and satisfactorily maintain public access to sidewalks, entrances, etc.

H. The CONTRACTOR shall erect barricades with flashing lights on public streets where construction excavation, debris, equipment, material, etc. is left overnight. All materials furnished and work performed as provided by this section shall be considered as a subsidiary obligation under this contract with no separate pay item provided.

3.4 Existing Signage: Any existing signs in conflict with lane closure signs and/or other construction signs shall be covered or temporarily taken down as required, at no additional cost. Only one signing sequence shall be visible at any one time.

3.5 Removal and Replacement of Existing Signs: Existing signs removed for construction shall be reinstalled to original location or relocated as directed by the ENGINEER at no additional cost to OWNER.

3.6 Removal of Temporary Signs: Remove temporary equipment and facilities when no longer required, restore grounds, to original, or to specified conditions.

3.7 Final Pavement Striping: The Contractor shall replace all striping damaged or removed by the Contractor's operations. Final pavement traffic striping shall match existing striping and shall be installed in conformance with Section 737 - Painted Traffic Striping of the referenced Standard.

PART 4 - MEASUREMENT AND PAYMENT

- (Barricades and Signage = Type I and II Barricades and Signage per City of Alexandria Details)
- (Traffic Control Set-Up = Closing and Opening of Traffic Lanes with Flaggers as Work Moves or Proceeds)
- (Traffic Control Device Operation = Manned Moving Flashing Vehicle or other type items)

4.1 Barricades and Signage for Major Street Closure:

A. Measurement: Barricades and signage for major street closure, including satisfactory installation and maintenance of signs, barricades, traffic control and safety items, completed and accepted as specified shall be measured per Each.

B. Payment: Barricades and signage for major street closure, measured as provided above, will be paid at the Contract unit price per Each, based upon approved estimated percent complete at time of pay request, which price and payment shall constitute full

compensation for furnishing all signs, barricades, traffic control and safety items in accordance with the Specifications.

C. Pay Item:

Barricades and Signage for Major Street Closure (07270)(01) per Each

Traffic Control Set-Up (07270)(02) per Each

4.2 Traffic Control Device Operation:

A. Measurement: Traffic control including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and/or as directed by the ENGINEER, will be measured per 8 Hour Day.

B. Payment: Traffic control, measured as provided above, will be paid at the Contract unit price per 8 Hour Day for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract Documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices..

C. Pay Item:

Traffic Control Device Operation (07270)(03) per 8 Hour Day

- END OF SECTION -

SECTION 07280

BEDDING MATERIAL

PART 1 – GENERAL

1.1 Scope: This Section covers all operations necessary to provide bedding or foundation material for all structures and or appurtenances, as shown on the DRAWINGS, as specified herein and or as directed by the ENGINEER, to provide a stable working table.

1.2 Reference Standard: Work shall conform to the following Section of the State of Louisiana, Department of Transportation and Development, "Louisiana Standard Specifications for Roads and Bridges", 2016 Edition, except as may be modified herein:

Section 726 – Bedding Material
Section 1003 – Aggregates

(References made to Measurement and Payment are hereby deleted)

PART 2 – PRODUCTS

2.1 Bedding Material:

A. Type "A" (0 to 8 inches thick): Sand aggregate, 1003.10.2 of the referenced Standard.

B. Type "B" (over 8 inches up to 16 inches thick): Gravel, 1003.10.3.1 of the referenced Standard.

C. Type "C" (over 16 inches up to 24 inches thick): Stone, 1003.02.2, of the referenced Standard.

D. Type "R" - Concrete Slurry: Refer to Section 07330 – Cast-In-Place Concrete.

PART 3 – EXECUTION

3.1 Installation: Install bedding material to widths and thicknesses as shown on the DRAWINGS in conformance with Section 726 of the referenced Standard and accepted by the ENGINEER.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Bedding Material:

A. Measurement: Bedding material of the different types and gradation and of various thicknesses including all work, labor, materials, tools, equipment and incidentals required to complete the item as specified herein and/or as directed by the ENGINEER, will be measured by the Cubic Yard in approved hauling vehicles in conformance with Section 109, paragraph 11 of the Referenced standard, installed and accepted.

B. Payment: Bedding material, measured as provided above, will be paid at the Contract price per Cubic Yard.

C. Pay Item:

Bedding Material (Type A) (Vehicular Measure) (07280)(01) per Cubic Yard.

Bedding Material (Type B) (Vehicular Measure) (07280)(02) per Cubic Yard.

Bedding Material (Type C) (Vehicular Measure) (07280)(03) per Cubic Yard.

Bedding Material (Type R) (Vehicular Measure) (07280)(04) per Cubic Yard.

END OF SECTION

SECTION 07290

SAW CUT PAVEMENT

PART 1 - GENERAL

1.1 Scope: Furnish all labor, materials, tools and equipment, and perform all operations required for saw cutting of portland cement concrete pavement and asphaltic concrete pavement in accordance with the Specifications.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 General: The locations to be saw cut shall be cut in a neat and straight manner as to not damage the surrounding pavement. The saw cut joint shall be cut full depth to facilitate removal of the pavement. Jagged edges will not be acceptable. The saw cut operation shall result in a smooth vertical face suitable for use as an expansion joint or contraction joint.

PART 4 MEASUREMENT AND PAYMENT

4.1 Sawcut Hard Surface Payment:

A. Measurement: Sawcut will be measured by the linear foot at full depth as directed by the ENGINEER.

B. Payment: Payment will be at the Contract unit price per Linear Foot.

C. Pay Items: Sawcut Hard Surface Pavement (Asphalt and Concrete) (Full Depth) (07290)(01) per Linear Foot.

- END OF SECTION -

SECTION 07310

CONCRETE FORMWORK

PART 1 - GENERAL

1.1 Scope: This Section includes the furnishing of all labor, materials, tools and equipment, and perform all operations necessary to furnish, place, finish, and cure portland cement concrete for those structures requiring form work.

1.2 Referenced Standard: Work shall conform to the following Sections of the State of Louisiana, Department of Transportation and Development, "Louisiana Standard Specifications for Roads and Bridges", 2016 Edition, except as may be modified herein:

Section 805 - Structural Concrete

All references made therein to measurement and payment are deleted.

1.3 Submittals: Submit product data in accordance with provisions of Section 01340 - Shop Drawings, Samples and Project Date.

1.4 Storage and Handling:

A. Forms shall be stored in a neat and orderly fashion and protected from damage.

B. If any form is deemed by the ENGINEER to be unfit for use, it shall be removed from the job.

C. Forms shall be cleaned and stacked immediately after stripping from concrete.

PART 2 - PRODUCTS

2.1 General: Materials shall conform to applicable provisions of Sections or Subsections referred to in the Referenced Standard.

PART 3 - EXECUTION

3.1 General: All work related to this Section shall conform to the applicable provisions contained in the Referenced Standard.

PART 4 - MEASUREMENT AND PAYMENT (NOT USED)

- END OF SECTION -

SECTION 07320

CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 Scope: This Section includes furnishing of all labor, materials, tools and equipment, and perform all operations necessary for concrete reinforcement work as required for the work.

1.2 Referenced Standard: Work shall conform to the following Sections of the State of Louisiana, Department of Transportation and Development, "Louisiana Standard Specifications for Roads and Bridges", 2016 Edition, except as may be modified herein:

Section 806 – Deformed Reinforcing Steel

All references made therein to measurement and payment are deleted.

1.3 Submittals: Submit Shop drawings, Samples and Project Data in accordance with Section 01340 - Shop Drawings, Samples and Project Data.

PART 2 - PRODUCTS

2.1 General: Reinforcement shall conform to Subsection 1009 of the Referenced Standard, except that all reinforcement shall be Grade 60.

PART 3 - EXECUTION

3.1 General: All work related to this Section shall conform to the applicable provisions contained in the Referenced Standard.

PART 4 - MEASUREMENT AND PAYMENT (NOT USED)

- END OF SECTION -

SECTION 07330

CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.1 Scope: This section covers the requirements for cast-in-place concrete required for this project including all work, labor, materials, equipment and incidentals required to complete the items as specified herein and or as directed by the ENGINEER.

1.2 Reference Standard: State of Louisiana Department of Transportation and Development Standard Specifications for Roads and Bridges – 2016 Edition.

Section 601 – Portland Cement Concrete Pavement
Section 901 - Portland Cement Concrete

(All references to Measurement and Payment are hereby deleted)

1.3 Submittals: Submit Product Data and Samples in conformance with Section 03340 Shop Drawings, Product Data, and Samples.

PART 2 – PRODUCTS

2.1 General: Material for portland cement concrete shall conform to the applicable sections and sub sections of the referenced Standard.

2.2 Flyash: Neither flyash nor ground, granulated blast furnace slag shall be used for any P.C.C. used for this project.

2.3 Non Shrink Cement Grout: Non shrink cement grout shall consist of cement, aggregate and additives formulated to meet the following volume change requirements. Early volume change (within 24 hours) as tested by ASTM C 827 shall be limited to zero (0%) percent shrinkage and four (4%) percent maximum expansion. Long term volume change of hardened non shrink cement grout (after 1 day of cure) shall conform to the Corps of Engineers Specifications for Non Shrink Grout, CRD-C621-82B. Shrinkage shall be zero (0%) percent and expansion limited to maximum of 0.4 percent volume change. Cement additives required to meet this specification shall be recommended by the grout manufacturer but shall be non staining and non metallic. Grout shall be equal to "Five Star" cement products manufactured by the U.S. Grout Corporation.

PART 3 - EXECUTION

3.1 General: Cast-In-Place concrete shall be installed in conformance with the referenced Standard except as may be modified herein.

3.2 Foot Traffic: All exposed cast-in-place concrete susceptible to foot traffic (walks and drives) shall have a rough broom or brushed finish.

3.3 Backfill and Compaction: Section 07150 – Excavation, Backfill and Compaction of Utility Trenches.

3.4 Concrete Structural Class and Compressive Strength: The average 28 day compressive strength and structural class for cast-in-place concrete for this project shall conform to the following chart;

ITEM	28 DAY COMPRESSIVE STRENGTH (PSI)	CONCRETE STRUCTURAL CLASS
Fence Posts, SMH Plugs, Thrust Blocking, Base Course, S.S. Service Cradles, S.S. Main Line and Service Line Plugs, Class R Bedding, etc.	1,800	R
Concrete Walks and Drives, Incidental Concrete, Valve Pads, Etc.	3,800	M
Concrete Street Surface, Structural Concrete, Etc.	3,800	A

PART 4 - MEASUREMENT AND PAYMENT

4.1 Removal and Replacement of Structural Concrete:

A. Measurement: Removal and replacement of structural concrete, including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and/or as directed by the ENGINEER, and measured by the Cubic Yard installed and accepted.

B. Payment: Removal and replacement of structural concrete, measured as provided above, will be paid at the Contract unit price per Cubic Yard for which payment shall provide for complete compensation for the work as measured above, installed in conformance with Contract Documents, and as per the scope of the work as related to the design intent, and per all approved and acceptable practices. (Saw-Cut Hard Surfaces Paid Elsewhere) (Pavement Repair or Replacement Paid Elsewhere) (Select Backfill Paid Elsewhere) (Traffic Control Paid Elsewhere)

C. Pay Item:

Removal and Replacement of Structural Concrete (07330)(01) per Cubic Yard

END OF SECTION

SECTION 07340

FLOWABLE FILL

PART 1 - GENERAL

1.1 Scope: This Section covers providing and placing flowable fill as shown on the DRAWINGS and or as directed by the ENGINEER.

1.2 Referenced Standard: Conform to the following Sections of the State of Louisiana, Department of Transportation and Development, "Louisiana Standard Specifications for Roads and Bridges", 2016 Edition, except as modified herein:

Section 710 - Flowable Fill

All references made therein to measurement and payment are deleted.

PART 2 - PRODUCTS

2.1 Flowable Fill: Flowable fill shall be a mixture of portland cement, fly ash, sand and water as specified as in Section 710 of the Referenced Standard.

PART 3 - EXECUTION

3.1 General: Install flowable fill as shown on the DRAWINGS.

3.2 Placement Control: Flowable fill shall be placed continuously after the work has been installed to the proper grade and alignment.

3.3 Method of Delivery: Any vehicle utilized for the delivery of flowable fill material shall be examined and approved by the ENGINEER prior to delivery. The maximum yardage calculations for each vehicle to be used will be submitted by the CONTRACTOR and verified by the ENGINEER on each vehicle prior to first delivery by said vehicle.

3.4 Delivery Tickets: Each load must be accompanied by a delivery ticket which must contain the following:

A. Load Number (loads must be sequentially numbered).

B. Yardage contained on each load.

C. Vehicle capacity as calculated by CONTRACTOR and approved by the ENGINEER.

D. Vehicle number or identification.

E. Operator's name.

F. Date and time of delivery.

Each delivery ticket must be signed by a checker on site representing the OWNER or the ENGINEER at a point to be designated by the ENGINEER.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Flowable Fill:

A. Measurement: Flowable Fill including all work, labor, materials, tools, equipment and incidentals required to complete the work as specified herein and/or as directed by the ENGINEER, will be measured by the Cubic Yard in approved hauling vehicles in conformance with Section 109 of the Referenced standard, installed and accepted.

B. Payments: Flowable fill, measured as provided above, will be paid at the Contract price per Cubic Yard.

C. Pay Items: Flowable Fill (07340)(01) per Cubic Yard.

- END OF SECTION -

SECTION 07350

MISCELLANEOUS TASK ORDER ITEMS

PART 1 - GENERAL

1.1 Scope: This Section covers miscellaneous construct equipment as may be used to complete Task Order.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

PART 4 - MEASUREMENT AND PAYMENT

4.1 Pump Maintenance Crew: CONTRACTOR shall furnish labor and equipment for the utilization of a pump maintenance crew consisting of 1 pump Tech., 1 laborer, 1 truck, 1 – 580 M backhoe and tools for repair and maintenance of pumps.

A. Measurement: Measurement shall be on a daily rate (8-hour) for the equipment and personnel and incidentals required.

B. Payment: Payment shall be on a daily rate (8-hour) for the equipment and personnel and incidentals required.

C. Pay Item: Pump Maintenance Crew (1 Pump Tech., 1 Laborer, 1 Truck, 1 – 580 M Backhoe, Tools) (07350)(01) per 8 Hour Day.

4.2 Machine Shop Work/Repair: Contractor shall perform repairs and/or refurbishment of mechanical equipment at the direction of the Owner and/or Engineer based upon the written scope of work issued in an approved Task Order.

A. Measurement: Machine shop work/repair including all work, labor materials, tools, equipment and incidentals required to complete the work will be measured by the "Third Party Approved Invoice Dollar Amount". This is a "pass through" item in that the work will be performed by third party personnel. Upon completion, said personnel will invoice the prime Contractor for completed work. This invoice will be included in the prime Contractor Partial Pay Estimate. The Contract Pay Item for this work will include a fifteen (15%) percent mark-up for overhead and profit.

B. Payment: Machine shop pump repair, measured as provided above, will be paid at the third party approved invoiced dollar amount plus fifteen (15%) percent for overhead and profit for which payments shall provide for complete compensation for the work as measured above.

C. Pay Item: Machine Shop Work/Repair (Pass Through) (Invoice Plus 15%) (07350)(02) per Third Party Approved Invoice Amount

4.3 Millwright, 3 Laborers, 1 Truck and Tools for Mechanical Work/Repairs:

A. Measurement: Millwright including 3 laborers, 1 truck, and tools for mechanical work/repair including all work, labor materials, tools, equipment and incidentals required to complete the work will be measured by the "Third Party Approved Invoice Dollar Amount". This is a "pass through" item in that the work will be performed by third party personnel. Upon completion, said personnel will invoice the prime Contractor for hours worked. This invoice will be included in the prime Contractor Partial Pay Estimate. The Contract Pay Item for this work will include fifteen (15%) percent mark-up for overhead and profit.

B. Payment: Millwright (mechanical), measured as provided above, will be paid at the third party approved dollar amount plus fifteen (15%) percent for overhead and profit for which payments shall provide for complete compensation for the work as measured above.

C. Pay Item: Millwright, 3 Laborers, 1 Truck and Tools for Mechanical Work/Repairs (Pass Through) (Invoice Plus 15%) (07350)(03) per Third Party Approved Invoice Amount.

4.4 PC-200 Excavator and Operator: CONTRACTOR shall furnish labor and equipment for the utilization of a PC-200 Excavator and operator for necessary items of construction. Also included in this item shall be all required insurance and licenses to operate the equipment and for the equipment operator and any other labor required to transport and setup the equipment and operator along with any other required incidentals to the construction site.

A. Measurement: Measurement shall be on a daily rate (8-hour) for the equipment and operator and incidentals required.

B. Payment: Payment shall be on a daily rate (8-hour) for the equipment and operator and incidentals required.

C. Pay Item: PC-200 Excavator and Operator (07350)(04) per 8 Hour Day.

4.5 PC-300 Excavator and Operator:

A. Measurement: CONTRACTOR shall furnish labor and equipment for the utilization of a PC-300 Excavator and operator for necessary items of construction. Also included in this item shall be all required insurance and licenses to operate the equipment and for the equipment operator and any other labor required to transport and setup the equipment and operator along with any other required incidentals to the construction site. Measurement shall be on a daily rate (8-hour) for the equipment and operator and incidentals required.

B. Payment: Payment shall be on a daily rate (8-hour) for the equipment and operator and incidentals required.

C. Pay Item: PC-300 Excavator and Operator (07350)(05) per 8 Hour/Day.

4.6 PC-400 Excavator And Operator: CONTRACTOR shall furnish labor and equipment for the utilization of a PC-400 Excavator and operator for necessary items of construction. Also included in this item shall be all required insurance and licenses to operate the equipment and for the equipment operator and any other labor required to transport and setup the equipment and operator along with any other required incidentals to the construction site.

A. Measurement: Measurement shall be on a daily rate (8-hour) for the equipment and operator and incidentals required.

B. Payment: Payment shall be on a daily rate (8-hour) for the equipment and operator and incidentals required.

C. Pay Item: PC-400 Excavator and Operator (07350)(06) per 8 Hour Day

4.7 D-39 Dozer and Operator:

A. Measurement: CONTRACTOR shall furnish labor and equipment for the utilization of a D-39 Dozer and operator for necessary items of construction. Also included in this item shall be all required insurance and licenses to operate the equipment and for the equipment operator and any other labor required to transport and setup the equipment and operator along with any other required incidentals to the construction site. Measurement shall be on a daily rate (8-hour) for the equipment and operator and incidentals required.

B. Payment: Payment shall be on a daily rate (8-hour) for the equipment and operator and incidentals required.

C. Pay Item: D-39 Dozer and Operator (07350)(07) per 8 Hour Day

4.8 Cubic Yard Dump Truck and Driver:

A. Measurement: CONTRACTOR shall furnish labor and equipment for the utilization of a 14 cubic yard dump truck and driver for necessary items of construction. Also included in this item shall be all required insurance and licenses to operate the equipment and for the equipment operator and any other labor required to transport and setup the equipment and operator along with any other required incidentals to the construction site. Measurement shall be on a daily rate (8-hour) for the equipment and operator and incidentals required.

B. Payment: Payment shall be on a daily rate (8-hour) for the equipment and operator and incidentals required.

C. Pay Item: 14 Cubic Yard Dump Truck and Driver (07350)(08) per 8 Hour Day

4.09 Truck and 50 Ton Low Boy:

A. Measurement: CONTRACTOR shall furnish labor and equipment for the utilization of a 50 ton lowboy trailer and truck to accommodate the trailer along with a certified driver and required labor, for necessary items of construction. Also included in this item shall be all required insurance and licenses to operate the equipment and for the equipment operator and any other labor required to transport and setup the equipment and operator along with any other required incidentals to the construction site. Measurement shall be on a daily rate (8-hour) for the equipment and operator and incidentals required.

B. Payment: Payment shall be on a daily rate (8-hour) for the equipment and operator and incidentals required.

C. Pay Item: Truck and 50 Ton Low Boy (07350)(09) per 8 Hour Day

4.10 Directional Bore Machine W/Operator and Locating Crew:

A. Measurement: CONTRACTOR shall furnish labor and equipment for the utilization of a Direction Boring Machine with minimum capability of 27,000 pound pullback, operator and locating crew for necessary items of construction. Also included in this item shall be all required insurance and licenses to operate the equipment and for the equipment operator and any other labor required to transport and setup the equipment and operator along with any other required incidentals to the construction site. Measurement shall be on a daily rate (8-hour) for the equipment and operator and incidentals required.

B. Payment: Payment shall be on a daily rate (8-hour) for the equipment and operator and incidentals required

C. Pay Item: Directional Bore Machine w/Operator and Locator Wire (07350)(10) per 8 Hour Day

4.11 PC35 Excavator, Foreman, Work Truck and 3 Man Crew:

A. Measurement: CONTRACTOR shall furnish labor and equipment for the utilization of a Foreman truck, work truck, PC35 excavator with a three man crew and operator along with a foreman, and all necessary items of construction. Also included in this item shall be all required insurance and licenses to operate the equipment and for the equipment operator and any other labor required to transport and setup the equipment and operator along with any other required incidentals to the construction site. Measurement shall be on a daily rate (8-hour) for the equipment and operator and crew with incidentals required.

B. Payment: Payment shall be on a daily rate (8-hour) for the equipment and operator and crew with incidentals required.

C. Pay Item: PC35 Excavator, Foreman Truck, Work Truck and Three Man Crew (07350)(11) per 8 Hour Day

4.12 General Superintendent and Truck:

A. Measurement: CONTRACTOR shall furnish labor and equipment for the utilization of a General Superintendent and work truck, and all necessary items of construction. Also included in this item shall be all required insurance and licenses to operate the equipment and for the equipment operator and any other labor required to transport and setup the equipment and operator along with any other required incidentals to the construction site. Measurement shall be on a daily rate (8-hour) for the superintendent, truck and incidentals required.

B. Payment: Payment shall be on a daily rate (8-hour) for the superintendent, truck with incidentals required.

C. Pay Item: General Superintendent and Truck (07350)(12) per 8 Hour Day

4.13 Special Lump Sum Railroad Crossing, Roadway Crossings, Roadway Crossings and Levee Crossings:

A. Measurement: Special crossings of the various types and sizes including Permits and insurance and items not measured elsewhere, and including all work, labor, materials, tools, equipment and incidentals required to complete work will be measured by the Lump Sum.

B. Payment: Special crossings, measured as provided above, will be paid at the Contract Lump Sum Price. (Carrier Pipe Paid Elsewhere) (Casing Pipe Paid Elsewhere) (Bore and Jack Paid Elsewhere).

C. Pay Item: Special Lump Sum Railroad Crossings, Roadway Crossings, Canal Crossings and Levee Crossings (Carrier Pipe Paid Elsewhere) (Casing Paid Elsewhere) (Bore and Jack Paid Elsewhere) (07350)(13) per Each

4.14 Approved Sub-Contractor Mobilization Fee:

A. Measurement: Sub-Contractor mobilization fee, approved by the Prime Contractor will be under the supervision of the Prime Contractor. Prime Contractors shall submit the Sub-Contractor invoice along with partial pay estimates. This item will be measured by the Sub-Contractor invoiced mobilization dollar amount plus fifteen (15%) percent for overhead and profit per Each.

B. Payment: Payment for Sub-Contractor mobilization fee will be billed by the Prime Contractor at cost plus fifteen (15%) percent for overhead and profit. Prime Contractor payment for this Bid item will be the Approved Sub-Contractor Mobilization Fee plus fifteen (15%) percent per Mobilization.

C. Pay Item: Approved Sub-Contractor Mobilization Fee (Pass Through) (Invoice Plus 15%) (07350)(14) per Sub-Contractor Approved Invoiced Mobilization Dollar Amount

4.15 4 Sided Slide Rail Trench System:

A. Measurement: Slide rail trench system will be measured per 8 Hour Day(s).

B. Payment: Per Each 8 Hour Day(s).

C. Pay Item: 4 Sided Slide Rail System 8'-8" Wide x 15 'x 2" x 16' D (07350)(15) per 8 Hour Day

4.16 Daily Rate for Utility Relocation Crew:

A. Measurement: Daily rate for utility relocation crew including all work, labor, materials, tools, equipment and incidentals and including 1 Superintendent, 3 Laborers, 1 Truck, 1 – 580M backhoe and tools required to complete the work will be measured per 8 Hour Day(s).

B. Payment: Per Each 8 Hour Day(s); installed, tested and accepted.

C. Pay Item: Daily Rate for Utility Relocation Crew (1 Superintendent, 3 Laborers, 1 Truck, 1 - 580 M Backhoe and Tools) (07350)(16)per 8 Hour Day.

4.17 Clean-up Maintenance Restoration:

A. Measurement: Clean-up, maintenance and restorations, etc., including all work, labor, materials, tools, equipment and incidentals required to complete the work will be measured per Linear Foot.

B. Payment: Clean-up, maintenance and restorations, etc., measured as provided above, will be paid at the Contract price per Linear Foot complete and accepted.

C. Pay Item: Clean-up, Maintenance and Final Restoration (07350)(18) per Linear Foot.

4.18 Electric Motor Repair:

A. Measurement: Electric motor repair, including all work, labor materials, tools, equipment and incidentals required to complete the work will be measured by the "Third Party Approved Invoice Dollar Amount". This is a "pass through" item in that the work will be performed by third party personnel. Upon completion, said personnel will invoice the prime Contractor for completed work. This invoice will be included in the prime Contractor Partial Pay Estimate. The Contract Pay Item for this work will include a fifteen (15%) percent mark-up for overhead and profit.

B. Payment: Electric motor repair, measured as provided above, will be paid at the third party approved invoiced dollar amount plus fifteen (15%) percent for overhead and

profit for which payments shall provide for complete compensation for the work as measured above.

C. Pay Item: Electric Motor Repair (Pass Through) (Invoice Plus 15%) (07350)(18) per Third Party Approved Invoice Amount.

4.19 Purchase and Provide Specialty Item or Equipment Not Included in Other Pay Items:

A. Measurement: Purchase and Provide Specialty Item or Equipment Not Included in Other Pay Items, including all work, labor materials, tools, equipment and incidentals required to complete the work will be measured by the "Third Party Approved Invoice Dollar Amount". This is a "pass through" item in that the work will be performed by third party personnel. Upon completion, said personnel will invoice the prime Contractor for completed work. This invoice will be included in the prime Contractor Partial Pay Estimate. The Contract Pay Item for this work will include a fifteen (15%) percent mark-up for overhead and profit.

B. Payment: Purchase and Provide Specialty Item or Equipment Not Included in Other Pay Items, measured as provided above, will be paid at the third party approved invoiced dollar amount plus fifteen (15%) percent for overhead and profit for which payments shall provide for complete compensation for the work as measured above.

C. Pay Item: Purchase and Provide Specialty Item or Equipment Not Included in Other Pay Items (Pass Through) (Invoice Plus 15%) (07350)(19) per Third Party Approved Invoice Amount.

- END OF SECTION -