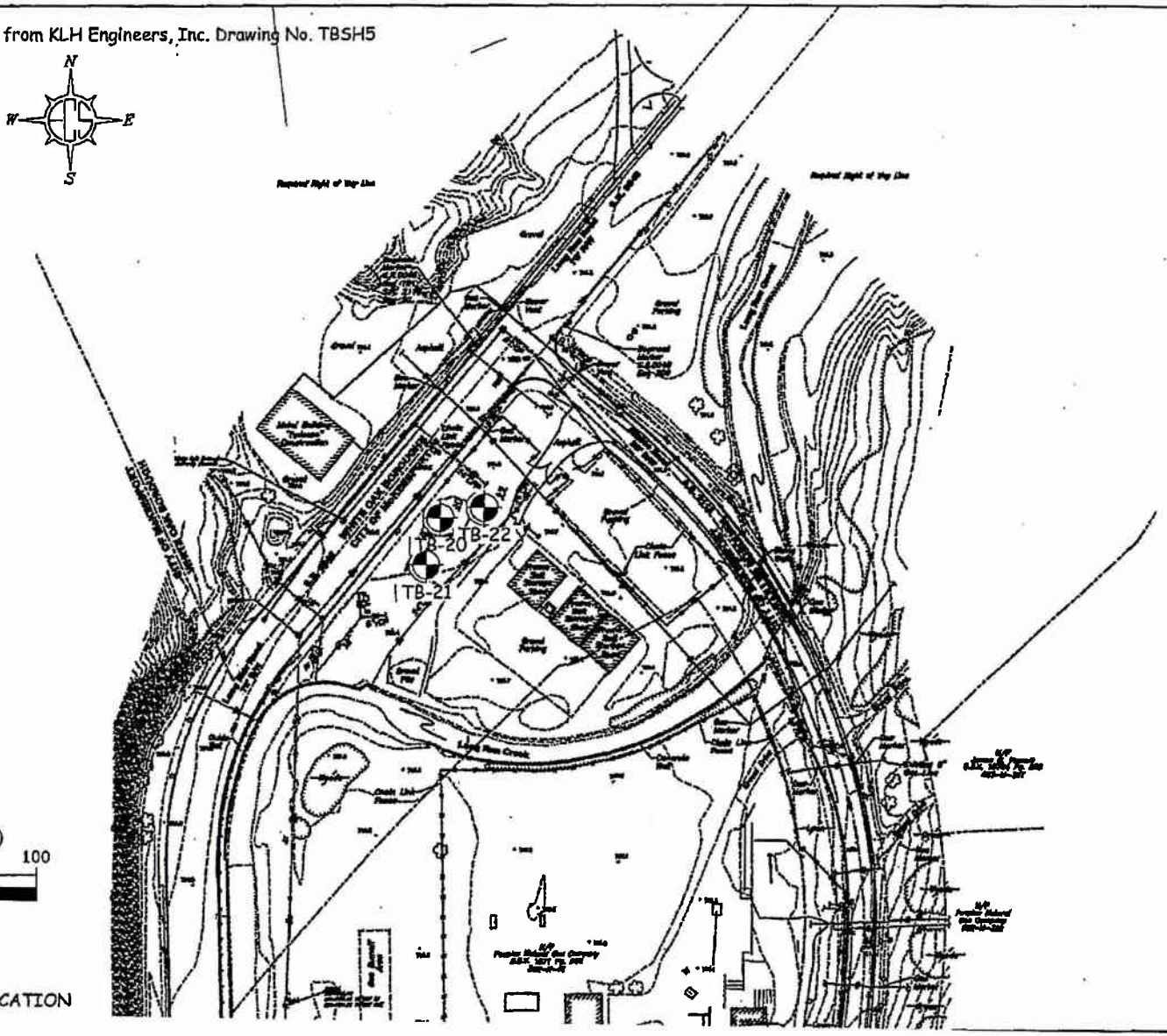
LEGEND
APPROX. BORING LOCATION
SCALE (IN FEET)
100
50
0
100
TB-15
TB-16
N
S
E
W
NOTE: Base drawing copied from KLH Engineers, Inc. Drawing No. TBSH2
ECS REVISIONS
ENGINEER JAM
DRAFTING AMH
SCALE 1" = 100'
PROJECT NO. 13-3549
SHEET 2 OF 4
DATE 04-10-09
BORING LOCATION DIAGRAM
KLH ENGINEERS
ECS LLC
MID-ATLANTIC
McKEESPORT WWTP
ADDITIONAL BORINGS
ALLEGHENY COUNTY

NOTE: Base drawing copied from KLH Engineers, Inc. Drawing No. TBSH3 and TBSH4
TB-24
TB-17
TB-18
TB-19
TB-23
W
N
S
E
100
50
0
100
SCALE (IN FEET)
LEGEND
APPROX. BORING LOCATION
BORING LOCATION DIAGRAM
KLH ENGINEERS
ECS LLC
MID-ATLANTIC
McKEESPORT WWTP
ADDITIONAL BORINGS
ALLEGHENY COUNTY
ENGINEER JAM
DRAFTING AMH
SCALE 1" = 100'
PROJECT NO. 13-3549
SHEET 3 OF 4
DATE 04-11-08
ECS REVISIONS

NOTE: Base drawing copied from KLH Engineers, Inc. Drawing No. TBSH5



SCALE (IN FEET)
50 100
100 0

LEGEND

APPROX. BORING LOCATION

McKEESPORT WWTP ADDITIONAL BORINGS

ALLEGHENY COUNTY

ECS LLC MID-ATLANTIC

BORING LOCATION DIAGRAM

KLH ENGINEERS

ECS REVISIONS

ENGINEER	DRAFTING
JAM	AMH

SCALE 1" = 100'

PROJECT NO. 13-3549

SHEET 4 OF 4

DATE 04-13-09

DIVISION I - GENERAL REQUIREMENTS

SECTION 01000

SCOPE

PART 1: GENERAL

1.01 The work under Contract No. 2010-15 covers the furnishing of all labor, material, plant, utilities required for the construction of sanitary sewage pressure sewers (forcemains) and appurtenances. The project is located along the west shore of the Youghiogheny River and extends through the City of McKeesport, Port Vue Borough and Liberty Borough, all within Allegheny County. Included in this work is construction of a portion the 20 inch diameter Long Run pump station pressure sewer located along between Walnut Street in the City of McKeesport and the east shoreline of the Youghiogheny River, and under the Youghiogheny River installed via horizontal directional drilling methods; and between the west shoreline of the Youghiogheny River and River Road in Liberty Borough at a termination point approximately 16 l.f. from the proposed valve vault constructed under Contract 2010-13, where the pressure sewer will ultimately be connected to a pressure sewer constructed by others for Elizabeth Borough. This project includes costruction of concrete valve vaults for the installation of air-vacuum relief valves.

PART 2: PRODUCTS

A. Not used.

PART 3: EXECUTION

A. Not used.

End of Section

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SECTION 01010

DRAWINGS INDEX

PART 1: GENERAL

1.01 DRAWINGS

A. The following drawings, dated January 2011 prepared by the KLH Engineers, Inc. accompany these specifications and are a part thereof. The drawings are the property of the ENGINEER and shall not be used for any purpose other than that intended by the specifications. The CONTRACTOR shall be responsible for purchasing all sets of drawings and specifications to be used in the progress of the work. Specification documents will be available for purchase from Accu-Copy Reprographics at the address shown on the Advertisement for the cost of reproduction. Unauthorized reproduction of the drawings or the specifications by the CONTRACTOR shall not be permitted.

Sheet	**Drawing No.**	**Title**
1 of 11	220-YRC1	Title Sheet
2 of 11	220-YRC2	Index Map
3 of 11	220-YRC3	Plan and Profile
4 of 11	220-YRC4	Plan and Profile
5 of 11	220-YRC5	Plan and Profile
6 of 11	220-YRC6	Plan and Profile
7 of 11	220-WSS6	Erosion and Sediment Pollution Control Plan Sheet 6 of 9
8 of 11	220-WSS7	Erosion and Sediment Pollution Control Plan Sheet 7 of 9
9 of 11	220-WSS 8	Erosion and Sediment Pollution Control Plan Sheet 8 of 9
10 of 11	220-WSS9	Erosion and Sediment Pollution Control Plan Sheet 9 of 9
11 of 11	220-YRC7	Right Of Way Plats

PART 2: PRODUCTS

A. Not used.

PART 3: EXECUTION

A. Not used.

End of Section

SECTION 01021

SUMMARY OF UTILITY WORK

PART 1: GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and the General and Supplementary Conditions and other Division 1 Specifications Sections, apply to this section.

1.02 PROJECT IDENTIFICATION

A. The project consists of Construction of Sanitary Sewers and Appurtenances. The work is shown on the Contract Documents prepared by KLH Engineers, Inc.

PART 2: PRODUCTS

A. Not used.

PART 3: EXECUTION

3.01 SCOPE OF WORK

A. All work shall be performed in accordance with the requirements of the Contract Documents. All materials and equipment furnished shall conform to the descriptions and requirements and all work shall be constructed complete in order to provide the OWNER with an operable installation which is ready for service.

B. Work under Contract No. 2010-15 includes work shown on the Drawings and described in these Technical Specifications in: Division 1, Summary of Work; Division 2, Site Work; Division 3, Concrete and Division 9. This CONTRACTOR is designated as the "coordinating contractor" and is responsible for overall scheduling, expediting, site supervision and all other duties required to maintain orderly construction.

C. The CONTRACTOR shall make his own arrangements concerning requirements for field offices; utilities; tool, equipment and material storage; and toilet facilities.

End of Section

SECTION 01040

COORDINATION

PART 1: GENERAL

1.01 WORK INCLUDED

A. The CONTRACTOR will conduct his work in such manner as not to prevent the operation of the OWNER's facilities.

B. The CONTRACTOR will be required to coordinate his work, to phase the construction operations, and provide, install and maintain any temporary connections necessary to permit the operation of the OWNER's facilities. Any construction work requiring the shut-down of facilities must be scheduled and performed only at such times as shall be authorized by the OWNER'S representative. Such work must be completed during the specific periods authorized by the OWNER's representative. It is anticipated that most work may be performed with regular time; however, it may be necessary that work will be performed during several shut-down periods and/or during periods of premium time payment to accomplish the desired construction. All costs to perform the CONTRACTOR's work, including premium time payments, shall be borne by the CONTRACTOR and are to be included in the contract price.

PART 2: PRODUCTS

A. Not used.

PART 3: EXECUTION

A. Not used.

End of Section

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SECTION 01042

SUPPLEMENTAL CONSTRUCTION CONDITIONS

PART 1: GENERAL

1.01 WORK INCLUDED

A. Field Measurements

1. The CONTRACTOR prior to ordering materials or starting construction shall verify existing elevations, building lines, pipe size and material, equipment connections, etc. All dimensions and clearances affecting the installation of work shall be verified in the field in relation to established datum, to building openings and to the work of other trades.

2. Should interferences occur which will necessitate deviations from layout or dimensions shown on the Drawings, the OWNER shall be notified and any changes approved before proceeding with the work.

B. Lifting Attachments

1. All material requiring hoisting for installation and/or demolition shall be provided with suitable lifting attachments as provided by the Manufacturer or the CONTRACTOR.

C. Protection and Storage of Material

1. The CONTRACTORS shall assume full responsibility for all materials received by them and shall provide adequate protection against exposure to the elements in accordance with the manufacturers recommendations. The means of protection shall be subject to the OWNER's approval.

D. Nameplates

1. All materials shall have factory applied permanent identifications indicating the manufacturer's name, model and serial numbers, temperature and pressure design and any other

data necessary to conform with specified requirements.

E. Night Work

1. Work after dark will not be permitted except under extreme emergency, or only under special directions, or if stated in the Special Requirements. The placing of concrete shall be started early enough in the daylight hours to insure completion of the section under construction before dark.

2. Whenever the CONTRACTOR finds it necessary or expedient to do work at night, such night work shall be performed by the CONTRACTOR without additional or extra cost to the OWNER, and only with the OWNER's approval. The CONTRACTOR shall provide all lights required for the proper and expeditious carrying on of any work.

F. Weather Conditions

1. No work shall be done when the weather is unsuitable. The CONTRACTORS shall take necessary precautions (in the event of impending storms) to protect all work, materials or equipment from damage or deterioration due to floods, driving rain, or wind and snow storms. The OWNER reserves the right to order that additional protective measures over and beyond those proposed by the CONTRACTORs be taken to safeguard all components of the project. The CONTRACTORs shall not claim any compensation for such precautionary measures so ordered, nor claim any compensation from the OWNER for damage to the work from weather elements.

G. Periodic Clean Up; Basic Site Restoration

1. During construction the CONTRACTORS shall regularly remove from the site of the work all accumulated debris and surplus materials of any kind which result from their operations. Unused equipment and tools shall be reasonably stored.

2. Where the work involves installation of sewers, drains, water lines, manholes, underground structures, or other disturbance of existing features in or across access roadways, the CONTRACTOR shall (as the work progresses) promptly backfill, compact, grade and otherwise restore the disturbed area to a basic condition which will permit resumption of vehicular traffic and any other critical activity or function consistent with the original use of the roadways. Unsightly mounds of earth, large stones, boulders and debris shall be removed so that the site presents a neat appearance.

3. The CONTRACTOR shall perform the clean up work on a regular basis and as frequently as ordered by the ENGINEER. Basic site restoration in a particular area shall be accomplished immediately following the installation or completion of the required facilities in that area. Furthermore, such work shall also be accomplished, when ordered by the ENGINEER, if partially completed facilities must remain incomplete for some time period due to unforeseen circumstances.

4. Upon failure of the CONTRACTOR to perform periodic clean up and basic restoration of the site to the ENGINEER's satisfaction, the CONTRACTOR shall be alerted and warned, the OWNER may, without prejudice to any other rights or remedies of the OWNER, cause such work for which the CONTRACTOR is responsible to be accomplished to the extent deemed necessary by the ENGINEER, and all costs resulting therefrom shall be charged to the CONTRACTOR and deducted from the amounts of money that may be due him.

H. Use of Facilities Before Completion

1. The OWNER reserves the right to enter and use certain portions of the constructed facilities before final completion of the whole work to be done under these contracts. However, only those portions of the facilities which have been completed to the ENGINEER's satisfaction shall be placed in service.

2. Consistent with the approved progress schedule, CONTRACTOR shall cooperate with the OWNER, his agents and the ENGINEER to accelerate completion of those facilities, or portions thereof, which have been designated for early use by the OWNER.

I. Codes and Ordinances

1. In addition to observing limitations of the easements and rights of way, the CONTRACTOR shall confine apparatus, storage of material and construction operations to the limits prescribed by ordinances or permits, or as may be directed by the OWNER and shall not encumber the job site.

2. The CONTRACTOR agrees to conform to, comply with and abide by, any and all laws, ordinances, rules and regulations of the Federal Government, State or local government which pertain to or in any way effect the work to be done by the CONTRACTOR, any and all instructions and regulations of the OWNER pertaining thereto, including any laws, ordinances, rules, regulations and instructions regarding signs, advertising, fire and/or smoking.

J. Safety Regulations

1. The CONTRACTOR shall comply with the requirements and standards of all Federal, State and local laws, ordinances, codes, rules and regulations governing safety and health. Protection shall be afforded to all persons having access to the job site.

2. Nothing in any paragraphs of these Contract Documents shall be construed as relieving the CONTRACTOR from full responsibility for safe prosecution of the work at all times.

K. Hazardous Materials at Job Site

1. In accordance with the intent of the Federal Occupational Safety and Health Administration Standard Section 29CFR-1910.12, Hazard Communication with effective date of May 25, 1986, the OWNER hereby notifies the CONTRACTOR

that the OWNER has no knowledge of hazardous materials existing at the site where work is to be performed.

2. The OWNER, CONTRACTOR and any subcontractors will each provide or make available to the others and any of them any written hazard communication program required to be maintained with respect to the site and any material safety data sheet and other hazard communication information required to be provided in accordance with Laws and applicable Regulations. CONTRACTOR shall be responsible for coordinating any such required exchange of documents or information between or among OWNER, CONTRACTOR and any subcontractors, or any of them. CONTRACTOR shall include the provisions of this paragraph in any subcontract for any part of the work at the site.

L. Potential Of Exposure To Raw Wastewater

1. The construction activities required to be performed in conduct of the work will necessitate the interconnection, interception, of existing manhole, sewer pipes and appurtenances. Said manhole, sewer pipes and appurtenances are conveying all wastes and runoff discharged to the public sewer system within the area served, which wastes may contain and/or generate toxic, noxious, oxygen depleting or other liquid or gaseous substances harmful to human beings. The CONTRACTOR shall, therefore, thoroughly instruct all of his personnel and those of any subcontractor or materialsman involved in such work so that appropriate and complete safety work practices are observed at all times. He shall also provide all personnel with all tools, clothing and other devices necessary for such safe practice, including appropriate waterproof clothing, respirators, protective glasses, mechanical air blowing equipment to pre-ventilate manholes and other chambers, explosive atmosphere detectors, ladders, safety harnesses, etc. No work shall be performed under any unsafe conditions and if same is detected at any time, the CONTRACTOR shall suspend operations immediately, and not resume his activities until

remedial measures have been taken or until the unsafe situation has otherwise been completely overcome.

M. Protection From Hazardous Substances And Contaminating Materials

1. CONTRACTOR shall take all measures to prevent the release, spillage or improper disposal of any hazardous substance or construction or waste materials which may contaminate the wastewater and/or water treatment process, equipment, tanks or piping, and the OWNER's or adjacent properties or the environment or substantially endanger human health. The transportation, handling, storage and use of gasoline, oils, paints, residual cleaning solvents and other hazardous substances or contaminating materials by CONTRACTOR or any subcontractor shall be in such a manner to prevent release, spillage or improper disposal. Should any such hazardous substances or contaminating materials be released, spilled or improperly disposed of by the CONTRACTOR or any subcontractors, the CONTRACTOR shall immediately notify the OWNER, notify any applicable environmental agency as required by law, and immediately remedy or remove such substances or materials, and clean and restore the affected areas to a safe condition and to the satisfaction of the OWNER and any applicable environmental agency. The CONTRACTOR shall pay all costs for the remedy or removal of contaminated materials and the proper disposal of them at an approved and permitted site and the restoration of the affected area. The CONTRACTOR shall also be responsible for the payments of and shall indemnify, hold harmless and defend the OWNER, ENGINEER and ENGINEER's Consultants from all penalties, fines and damage claims resulting from the release, spillage or improper disposal by CONTRACTOR or any subcontractor of any such hazardous substances or contaminating material.

PART 2: PRODUCTS

A. Not used.

PART 3: EXECUTION

A. Not used.

End of Section

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SECTION 01090

REFERENCES

PART 1: GENERAL

1.01 WORK INCLUDED

A. Where reference is made in these documents to Government Specifications or to those of recognized organizations such as ASTM, ASME, etc., the latest editions shall be used.

PART 2: PRODUCTS

A. Not used.

PART 3: EXECUTION

A. Not used.

End of Section

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SECTION 01170

SURVEYS

PART 1: GENERAL

1.01 Benchmarks are available in the general vicinity of the project location. The OWNER's Project Representative will locate the alignment position of all proposed manholes in the field. The CONTRACTOR shall furnish a competent survey crew, under the direction of a PA Licensed Surveyor, for the purpose of performing all necessary surveys required to place off-set stakes, determine elevations, prepare cut sheets, operate laser equipment or to perform similar work required to assure construction at the lines and grades shown on the Drawings, or as required in the field. In addition it shall be the responsibility of the survey crew to replace property corners and property line pins disturbed by construction activities.

1.02 Construction of sewer lines by the use of laser beams shall not negate the field surveying which will still be required to be performed prior to excavation. The CONTRACTOR shall also make the survey crew available to the ENGINEER for checking grades and/or alignments when the ENGINEER deems it necessary to have such assistance.

PART 2: PRODUCT

A. Not used.

PART 3: EXECUTION

A. Not used.

End of Section

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SECTION 01200

PROJECT MEETINGS

PART 1: GENERAL

1.01 PROGRESS MEETINGS

A. Purpose: Regular monthly meetings are for the purpose of modifying work schedules and to arrive at an orderly sequence of operations agreeable to the parties of the Contract. Meetings shall serve to resolve conflicts, adjust work arrangements, etc., so that work stoppages and delays may be avoided.

B. Scheduling Additional Meetings: In addition to regularly scheduled meetings, the ENGINEER may schedule a meeting when required by any party to the Contract. The ENGINEER will give to each party written notice of the time and place, and agenda of each such scheduled meeting.

C. Meeting Representation: Each party to the Contract shall be represented at such meetings by a person or persons vested with the authority to make necessary decisions on their behalf, and such decisions shall commit that party to the agreed procedures, sequence of operations and time schedules.

D. Where procedures, sequence of operations, time schedules and other matters have been agreed upon by each party concerned, it shall become binding upon each party to follow and comply with said procedures, sequence of operations, time schedules, and other matters, both as to time performance, and no claim of delay or damages by the CONTRACTOR if he fails to comply therewith will be entertained by the OWNER.

PART 2: PRODUCTS

A. Not used.

PART 3: EXECUTION

A. Not used.

End of Section

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SECTION 01301

SUBMITTALS

PART 1: GENERAL

1.01 WORK INCLUDED

A. Shop Drawings

1. Each CONTRACTOR shall submit to the ENGINEER a minimum of six (6) copies of all Shop Drawings and information required for the work. Four (4) copies shall be retained for distribution to the OWNER, ENGINEER AND OWNER'S REPRESENTATIVE. All Drawings and information shall contain sufficient data to ascertain compliance with the Contract Documents. Incomplete, inadequate or unidentified submittals will be rejected. The ENGINEER will examine submittals only after they have been properly identified, as described later in this clause, and signed by the CONTRACTOR to indicate that he has reviewed and endorsed them.

2. The ENGINEER will review submittals only for conformance with the design concept of the project and with the information given in the Contract Documents. Review of submittals shall not relieve the CONTRACTOR from responsibility for deviation from the Contract Documents unless specifically noted in the submittal and no exception is taken by the ENGINEER. The CONTRACTOR is responsible for confirming and correlating all quantities, dimensions, fabrication details and techniques, installation methods and performance of the work. The CONTRACTOR shall check and verify all field measurements.

3. All submittals must be complete, accurate and provide sufficient detail to indicate item by item compliance with the Contract Documents. The ENGINEER will receive any submittal that the CONTRACTOR cares to present.

4. When shop drawings include wiring diagrams, piping, equipment or other data which must be

coordinated with the work of other CONTRACTORs, additional copies of the submittal shall be furnished for review and for distribution by the ENGINEER.

5. To facilitate review, the CONTRACTOR shall number consecutively each submittal. This numbering system should be in order of submittal. Any resubmittal required shall have the same number as the original submittal, followed by notation signifying that it is a second (or third, etc.) submittal, e.g. #14 (2nd sub.). In addition, all submittals shall have the following information placed on them by the CONTRACTOR, and review of a particular submittal will be undertaken only if such information is provided:

   Shop Submittal Number _____
   Deviations: None_____: As Listed:_____
   Reference Specification Number _____
   Reference Drawing Number _____
   Space Requirement: As Designed _____
   Different, as Listed _____
   Contractor has reviewed and submitted for review
   Signature _____
   Date _____

6. Make the corrections indicated on the returned shop drawings and resubmit six (6) corrected copies for final approval, furnishing such other copies that may be needed. No work shown on shop drawings shall be started until same has been returned approved.

B. Independent Commercial Testing Laboratory Services

1. When a proposed project or series of projects involves installation of more than a total of 3000 lineal feet of polyvinyl chloride sewer pipe (regardless that different diameter pipe may aggregate that amount) the CONTRACTOR shall furnish, during pipe delivery and construction, reports of an independent commercial testing laboratory.

2. Said reports shall set forth critical pipe characteristics such as materials tests;

hydrostatic tests (infiltration); pipe dimensions; gasket testing; deflection (PVC); absorption (RC) and such other test results which will confirm conformance with these and the referenced ASTM, AWWA and other standards contained herein. One pipe section of every 200 sections manufactured and delivered, regardless of length of each pipe, shall be selected at random by the testing laboratory representative and transported to the commercial lab for such purposes.

C. Record Drawings

1. The CONTRACTOR is responsible for maintaining two (2) sets of Record Drawings. One set of the Record Drawings shall be left with the OWNER at the completion of the project, while the other set shall be delivered to the ENGINEER before application for final payment.

2. All records shall be kept by the CONTRACTOR for all deviations in location or elevation of any installation from that shown on the Contract Drawings. Record Drawings shall include but not be limited to the following: structural locations, piping locations, equipment locations, revisions to schematic diagrams, etc. Records shall also be kept of any significant changes from approved shop drawings or Contract Drawings. Records shall consist of marked shop or Contract Drawings and shall be submitted to the OWNER at any time upon request.

3. Each record drawing shall be certified by the CONTRACTOR as an accurate representation of the completed work.

D. Photographs/Video Tape (Optional)

1. The CONTRACTOR shall photograph and video tape all work areas of the project. The project representative is to designate areas to be photographed and video taped. The photographs and video tape shall be dated (month/day/year/time). The video shall be VHS format, color and voice narrated to indicate the activity and/or

facilities being constructed. Two (2) copies of the photographs and video tape shall be submitted monthly to the ENGINEER and will become the property of the OWNER.

PART 2: PRODUCTS

2.01 BUY AMERICA

A. In accordance with federal regulations and guidelines the CONTRACTOR agrees that preference will be given to domestic construction materials by the CONTRACTOR, subcontractors, materials and suppliers in the performance of this contract.

2.02 STEEL PRODUCTS

A. Each CONTRACTOR, equipment and material supplier on these contracts is notified that materials utilized under these contracts must comply with te provisions of the Act of march 3, 1978 (P.L.G. No. 3) Known as the "Steel Products Procurement Act". The CONTRACTOR is required to submit Form SP) (Page B-7) with each initial shop drawing submittal.

PART 3: EXECUTION

3.01 SCOPE OF WORK

A. The CONTRACTORS shall furnish but are not limited to the following submittals:
   1. Schedule of Values
   2. Construction Schedule
   3. Material Data
   4. Calculations (as required)
   5. Logs and Records (as required)

End of Section

SECTION 01500

TEMPORARY FACILITIES AND CONTROLS

PART 1: GENERAL

1.01 TEMPORARY SERVICES

A. GENERAL: Provide temporary services at the site of the Work throughout the entire period of construction and until the Work of the Contract is completed and the new facilities are placed in operation by the Authority's personnel.

B. Temporary Water Control:

1. At all times during the construction of work of this Contract maintain the flow of storm water, naturally occurring water and wastewater in existing facilities and channels affected by the Work.

2. Particular attention is directed to the above requirement in regard to the maintenance of flow in existing sewer service connections during removal and replacement of the sewer main.

3. CONTRACTOR assumes risk from floods or other causes, and any damages done to the work in progress or to work completed under Contract. Make repairs and replacements to the satisfaction of the ENGINEER.

4. CONTRACTOR assumes responsibility for damages to property caused by flooding or backflooding of property due to blocking or restriction of storm water passages, natural waterways and wastewater facilities capacity during normal or excessive periods of water flow.

5. At any time do not permit wastewater flow from existing sewers to flow into nearby waterways or to flow on surface areas. Furthermore, should an accidental discharge occur, notify the Department of Environmental Protection immediately.

6. The means and methods the CONTRACTOR employs to meet above requirements are at his discretion but will be subject to the ENGINEER's approval.

PART 2: PRODUCTS

A. Not used.

PART 3: EXECUTION

3.01 REMOVAL

A. CONTRACTOR shall dismantle (if required) and remove such temporary facilities as required during construction of the project.

End of Section

SECTION 01501

CONSTRUCTION FACILITIES

PART 1: GENERAL

1.01 Immediately after the Contract has been formally executed by the OWNER, the CONTRACTOR shall furnish a separate field office trailer with minimum dimensions of 30' x 8' for the use of the OWNER's Representatives during the period of construction (Contract Time). The office shall be properly lighted, heated and air conditioned and shall be equipped with a telephone and fax machine (two phone lines) for the use of the OWNER's Representatives. It shall also be provided with suitable sanitary facilities and equipped with potable water. The costs of all utility services and all service and toll telephone charges shall be paid by the CONTRACTOR. It shall be provided with a plain paper photocopier, a locked, four drawer filing cabinet and each of the following items: desk and chair, drafting table and stool, plan rack (hanging type), table, bookcase and bulletin board. The office shall not be vacated or moved from the construction site until the Contract time expires or approval of the final estimate by the OWNER's Representative, should the CONTRACTOR not complete the work in the Contract time. The trailer shall be located adjacent to the CONTRACTOR's office.

1.02 The CONTRACTOR shall provide and make his own arrangements for his field office facilities, change trailers, tool, equipment, material storage and toilet facilities. The CONTRACTOR's office facilities shall be separate from the OWNER's Field office facilities.

PART 2: PRODUCT

A. Not used.

PART 3: EXECUTION

A. Not used.

End of Section

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SECTION 01550

TRAFFIC CONTROL

PART 1: GENERAL

1.01 Whenever in the ENGINEER's judgment it is reasonably possible to do so, a minimum of one lane of traffic shall be maintained on all streets, roadways and other traveled ways at all times during construction of this project in order to accommodate the residents of the area as well as emergency fire, ambulance and similar vehicular traffic. Suitable and adequate barricades shall be erected and properly maintained by the CONTRACTOR at all times during the course of construction work to clearly and properly caution and protect traffic and pedestrians from open excavations. An adequate number of flagmen shall be utilized to guide traffic along all areas where work is being performed or where hazardous driving conditions prevail. Advance notice to the general public, the School District (for bus routing) and the Municipal Office and shall be given by the CONTRACTOR before actual excavation in any particular area is commenced.

1.02 Where pipe lines and/or other facilities are constructed along State Highways, Municipal streets, and where construction activities may otherwise impede normal vehicular traffic patterns on said streets, the control of traffic shall be accomplished in accordance with the details set forth in Publication 213 of the Pennsylvania Department of Transportation, the title of which is "Traffic Control Guidelines".

1.03 The position of work zone signs, erection of signs, sizes of signs, details and configuration of signs, traffic channelizing, tapered lengths/spacing, cones, drums, vertical panels, lighting devices, arrow boards and all flagging conduct and activities shall conform to the details described therein. The location and configuration of traffic control methods shall conform to those graphically illustrated on the appertaining Table 5 and Figures 5 through 23 shown in the publication. The CONTRACTOR shall submit a traffic control plan and procedure (conforming to the above referenced Publication 213) to the OWNER and to the Pennsylvania Department of Transportation for approval, prior to commencing with field construction.

PART 2: PRODUCTS

2.01 The CONTRACTOR shall be responsible to furnish all required flags, cones, signs etc. and all items shall meet the requirements of the PA Department of Transportation.

PART 3: EXECUTION

A. Reference Section 01551 Barriers and Enclosures.

End of Section

SECTION 01551

BARRIERS AND ENCLOSURES

PART 1: GENERAL

1.01 CONTRACTOR shall provide all required warning signs, lights and barricades during the course of construction and said facilities shall be maintained by the CONTRACTOR at all times during the course of the construction work to clearly caution and protect traffic and pedestrians from open excavations, unstable filled areas, obstructions and other hazards directly or indirectly resulting from construction activities. Warning signs, barricades and hand rails shall be erected and a sufficient number of high intensity warning lights shall be appropriately located for use at night and at times when visibility is poor.

1.02 Trenches at any and all locations where pedestrian or vehicular traffic hazards would result, shall not be left open during non construction hours, unless they are suitably covered with a steel plate which is adequately anchored and reinforced to sustain traffic loads which may be imposed. All excavations within road rights of way shall be closed overnight and over weekends and marked with a flashing traffic marker to warn motorists and pedestrians. Except in cases of emergencies, no roadways streets, alley or driveways shall be left impassable overnight.

PART 2: PRODUCTS

A. Not used.

PART 3: EXECUTION

A. Not used.

End of Section

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SECTION 01570

TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1: GENERAL

1.01 DESCRIPTION

A. The CONTRACTOR shall conduct their activities and shall program trenching and restoration operations in such a manner as to minimize pollution of the creeks from erosion of the freshly excavated and/or backfilled materials during periods of excavation and surface water runoff. CONTRACTORS shall reduce the area and duration of exposure of all erodible soils by the greatest extent practicable and to that end, hydromulching, reseeding and other specified surface restoration shall be required to closely follow backfilling operations. The type of seeding/ restoration required for the various job locations is listed on the E&S Control Plan Drawing. Where the Erosion and Sedimentation Control Plan calls for runoff devices or the OWNER's Project Representative so directs in the field, sediment traps, hay bales and/or other means to retard runoff rates shall be installed. Similar holding basins or other sediment trap arrangements shall be installed. Similar holding basins or other sediment trap arrangements shall also be required to be installed at the discharge of dewatering pumps. Discretion shall be exercised in selecting the number and location for encroachments during the construction both in and along the creeks such that a minimum of stream disturbance and erosion pollution results. The Soil Erosion and Sediment Pollution Controls approved by the County Soils Conservation Service, and the Pennsylvania Department of Environmental Protection are identified in the contract drawings. The CONTRACTOR shall be responsible for all fines, fees, penalties, etc. imposed upon the OWNER as a result of the CONTRACTORS construction activities, methods/ procedures and or lack of construction activities methods/procedures.

1.02 APPROVED PLAN

A. The Contract Drawings contain the approved Erosion Sediment Control Requirements pertaining to the project construction.

B. The CONTRACTOR shall implement and maintain sediment control Best Management Practice(BMP) devices.

C. The CONTRACTOR shall have available at the project site at all times a copy of the approved plan.

D. The CONTRACTOR is advised to become thoroughly familiar with the provisions of the Appendix 64, Erosion Control Rules and Regulations, Title 25, Part 1, Department of Environmental Protection, Subpart C, Protection of Natural Resources, Article III, Water Resources, Chapter 102, Erosion Control.

E. CONTRACTOR shall secure approved Erosion Sedimentation Control Plans for work outside indicated rights of ways, construction strips, CONTRACTOR dump sites, etc or other environmental permits.

PART 2: PRODUCTS

2.01 SEED AND SOD

A. Seed, sod, mulches, fertilizer, topsoil, soil conditioner, and other materials shall be as specified herein these Contract Document and or the Erosion Sediment Control Plan Drawings.

2.02 MATERIAL FOR EROSION AND SEDIMENT CONTROL DEVICES

A. Geotextiles, silt fence sediment control geotextile, surge stone, rip rap, filter bags, straw bale dike, silt fence post, straw bale stakes, chain link fence for super silt fence shall be in accordance with requirements of Chapter 102 Erosion Protection.

PART 3: EXECUTION

3.01 GENERAL REQUIREMENTS

A. Clear only areas designated on drawings within limits of rights of ways, easements or work limits and as specified herein and as directed by the OWNER's Representative.

B. Protect excavated material and disturbed areas from erosion into waters or onto adjacent land. Stockpile excavated material on high side of trench.

C. Install sediment control BMP devices following Drawings or as directed by the OWNERS Representative during initial clearing and grubbing operations.

D. Maintain erosion and sediment control measures and devices until final restabilization and restoration are complete, unless otherwise directed by the OWNERS Representative.

E. The CONTRACTOR shall assure that the approved erosion and sediment control plan is properly and completely implemented.

F. Until the site achieves final stabilization, the CONTRACTOR shall assure that the best management practices are implemented, operated, and maintained properly and completely. Maintenance shall include inspections of all best management practice facilities. The CONTRACTOR shall maintain and make available to local Conservation District complete, written inspection logs of all those inspections. All maintenance work, including cleaning, repair, replacement, regarding, and restabilization shall be performed immediately.

G. Immediately upon discovering unforeseen circumstances posing the potential for accelerated erosion and/or sediment pollution, the CONTRACTOR shall implement appropriate best management practices to eliminate potential for accelerated erosion and/or sediment pollution

H. Before initiating any revisions to the approved erosion and sediment control plan or revisions to

other plans which may affect the effectiveness of the approved E&S Control Plan, the operator must receive approval of the revisions from the local Conservation District. All pumping of sediment laden water shall be through a sediment control BMP, such as a pumped water filter bag discharged over non-disturbed areas.

I. Erosion and sediment BMP's must be constructed, stabilized, and functional before site disturbance begins within the tributary areas of those BMP's

J. After final site stabilization has been achieved, temporary erosion and sediment BMP controls must be removed. Area disturbed during removal of the BMP's must be stabilized immediately.

K. Immediately after earth disturbance activities cease, the CONTRACTOR shall stabilize any areas disturbed by the activities. During non-germinating periods, mulch must be applied at the specified rates. Disturbed areas which are not at finished grade and which will be redisturbed within 1 year must be stabilized in accordance with the permanent vegetative stabilization specifications.

L. An area shall be considered to have achieved final stabilization when it has a minimum uniform 70% perennial vegetative cover or other permanent non-vegetative cover with a density sufficient to resist sliding and other movements.

M. Sediment must be removed from the storm water inlet protection after each runoff event.

N. At stream crossings, 50' buffer areas should be maintained. On buffers, clearing, sod disturbances, excavation, and equipment traffic should be minimized. Activities such as stacking logs, burning cleared brush, discharging rainwater from trenches, welding pipe sections, refueling and maintaining equipment should be accomplished outside of buffers.

O. Hay or straw mulch must be applied at 3.0 tons per acre.

P. Mulch with mulch control netting or erosion control blankets must be installed on all slopes 3:1 and steeper.

Q. Straw mulch shall be applied in long strands, not chopped or finely broke.

R. Until the site is stabilized, all erosion and sediment BMP's must be maintained properly. Maintenance must include inspections of all erosion and sediment control BMP's after each runoff event and on a weekly basis. All preventative and remedial maintenance work, including clean out, repair, replacement, regarding, reseeding, remulching, and renetting, must be performed immediately. If erosion and sediment control BMP's fail to perform as expected, replacement BMP's or modifications of those installed will be required.

S. Sediment removed from BMP's shall be disposed of in landscaped areas outside of steep slopes, wetlands, floodplains or drainage swales and immediately stabilized, or place in topsoil stockpiles.

T. The CONTRACTOR shall remove from the site, recycled, or dispose of all building materials and waste in accordance with the Department's Solid Waste Management Regulations at 25 Pa. Code 260.1 et seq., 271.1 et seq. The CONTRACTOR shall not illegally bury, dump, or discharge and building material or waste at the site.

3.02 STABILIZATION OF DISTURBED AREAS

A. Following initial disturbance, complete permanent or temporary stabilization.

B. Stabilization:
   1. Temporary: Consisting of vegetation, anchored straw mulch, mulch netting, jute, excelsior blankets, wood chips, surge stone or stone mulch.

   2. Permanent: Following restoration schedule on Drawings.

3.03 EROSION AND SEDIMENT CONTROL DEVICES

A. Install BMP devices shown on Drawings, or at OWNERS Representative direction, and following Standard Details. Maintain sediment control devices to contain surface drainage and prevent sediment from leaving confines of work site.

B. Silt Fence

1. Definition: Temporary continuous barrier constructed of sediment control geotextile supported by posts used to trap sediment but allow surface runoff to filter through.

2. Construction: See Erosion Sediment Pollution Control Plan Drawings.

3. Maintenance: Remove sediment deposits as required.

a. Areas where construction activities have changed natural contour and drainage runoff: Review daily silt fence locations to ensure effectiveness.

1). Where deficiencies exist, install additional silt fences under ESC Inspector's direction.

2). Promptly repair or replace damaged or otherwise ineffective silt fence.

b. Areas where construction activities have not changed natural contour and drainage runoff: Periodically, inspect and repair damage to silt fence to ensure effectiveness

4. Removal upon notice by OWNER's Representative restoration is complete and acceptable. Fill depressions and restore area following restoration schedule.

C. Super Silt Fence

1. Definition: Temporary continuous barrier of sediment control geotexile placed over chain link fencing used to intercept sediment.

2. Construction: See Erosion Sediment Pollution Control Plan Drawings.

3. Maintenance: See silt fence specification.

4. Removal and Restoration: Follow silt fence specification and replace with silt fence when directed by OWNERS Representative.

D. Rip Rap Stream Bank Protection at Utility Stream Crossing.

1. Definition: Placement of ungrouted riprap on stream banks for permanent stabilization at each utility stream crossing.

2. Construction: Follow Standard Detail and as specified below.

   a. Install stream diversion when flow is impacted by excavation or fill.

   b. Riprap as specified in Section 02370.

3. Restoration: Within 7 days after utility is installed crossing stream, restore banks of stream with riprap following Drawings and Standard Details.

E. Control Turf Reinforcement Mat at Utility Stream Crossings.

1. Definition: Placement of a rolled erosion control product manufactured of natural fibers mechanically formed and/or bonded into the synthetic nettings to produce a permanent three dimensional structure.

2. Construction and restoration shall be in accordance with the Erosion Sedimentation Control

Plan and the provisions of Chapter 102 Erosion and Sediment Control.

F. Stone Outlet Sediment Trap

1. Definition: Temporary basin formed by excavating a depression in ground or by building earth embankment or dike that collects runoff and traps sediment allowing filtered runoff to leave site through stone outlet.

2. Construction and maintenance shall be in accordance with the Erosion Control Plan and the provisions of Chapter 102 Erosion and Sediment Control.

G. Stone Outlet Structure

1. Definition: Stone berm used in conjunction with earth or straw bale dike to provide sediment filtering device for runoff and discharge onto well stabilized area.

2. Construction and maintenance shall be in accordance with the Erosion Control Plan and the provisions of Chapter 102 Erosion and Sediment Control.

H. Straw Bale Dike

1. Temporary continuous barrier construction of straw or hay bales placed and anchored together, used to trap sediment but allow rainfall runoff to filter through.

2. Construction and maintenance shall be in accordance with the Erosion Control Plan and the provisions of Chapter 102 Erosion and Sediment Control.

I. Inlet Protection

1. Definition: Device used to prevent sediment from entering existing storm drains.

2. Construction and maintenance shall be in accordance with the Erosion Control Plan and the

provisions of Chapter 102 Erosion and Sediment Control.

J. Stream Crossing

1. At locations shown on the construction drawing, the proposed pipe lines will cross a stream. Said crossings shall be accomplished by installing the sewer pipe (as shown on the Contract Drawings) to the specified grade and depth. The sewer pipe shall then be encased in concrete with a minimum thickness of 6" of concrete surrounding the pipe. The concrete encasement of the sewer pipe shall extend between the tops of the stream banks or, where such banks are not evident, a minimum distance of 10 feet beyond the normal stream channel. Concrete encasement is not required at locations where ductile iron pipe is installed across the stream.

2. It is important that the stream crossing be constructed quickly to minimize disturbance in the stream. Where practical, each stream crossing shall be constructed within a single 24-hour period.

3. All stream crossings shall be constructed according to the procedure outlined on the Erosion and Sediment Pollution Control Plan. Dewatering of trenches shall be done in accordance with the requirements set forth in these specifications and the Erosion and Sediment Pollution Control Plan narrative. Backfill shall consist of the excavated material unless the same is deemed unsuitable by the OWNERS engineers at the time of excavation. A temporary sedimentation control device as shown on the E&S Plan drawing shall also be utilized in the stream during installation of said sewer line crossings.

4. Permanent erosion and sedimentation control devices shall be required along those portions of stream banks disturbed by the installation of the sewer line crossings. Within 10 days following installation of each of the pipe line stream crossings, control turf reinforcement mat shall

be placed along the banks of the streams shown on the Contract Drawings.

a. The erosion control turf reinforcement mat shall be North American Green P-300 or approved equal, having consistent thickness with synthetic fibers evenly distributed over the entire area of the mat. The matting shall be covered on the top with black heavyweight UV stabilized polypropylene netting having ultraviolet additives to prevent breakdown and an approximate 0.50 x 0.50 inch (1.27 x 1.27 cm) mesh size. The bottom net shall also be UV stabilized polypropylene, with a 0.625 x 0.625 inch (1.57 x 1.57 cm) mesh size. The matting shall be sewn together on 1.50 inch (3.81 cm) centers with UV stabilized polypropylene thread.

3.04 CONSTRUCTION OPERATIONS

A. Do not begin construction operations until required erosion and sediment control devices are in place and functioning.

B. Do not violate requirements of Erosion and Sediment Control Permit during construction operations.

C. Pennsylvania Department of Environmental Protection must approve changes to approved Sediment Control Plan.

3.05 FIELD CONDITIONS

A. Immediately notify ENGINEER if conditions arise in field that renders Drawings, these specifications, or requirement of the approved Erosion and Sediment Control Plan inappropriate or inadequate. ENGINEER will furnish additional Drawings or modifications, when required, which will become part and condition of Erosion and Sediment Control Plan.

End of Section

SECTION 01651

PIPE LINE/COMMISSIONING

PART 1: GENERAL

1.01 WORK INCLUDED

A. The CONTRACTOR shall provide, complete and ready for use, all of the pipe line system and appurtenances and shall perform such operations and tests, all as specified herein and as indicated on the drawings.

B. All pipe lines shall be installed by skilled mechanical erection labor in accordance with manufacturer's instructions.

PART 2: PRODUCTS

A. Not used.

PART 3: EXECUTION

3.01 INSTALLATION

A. Inspection And Tests

1. Tests shall be performed on all piping, equipment and complete systems. The CONTRACTOR shall provide labor, materials, tools, air, water, power and supplies of any kind required for testing and adjusting of equipment and systems. Each CONTRACTOR is responsible for testing systems which he has furnished.

2. Material and/or equipment damaged or shown to be defective shall be repaired or replaced to the satisfaction of the OWNER.

3. All tests shall be made only after notification to and in the presence of the OWNER.

4. Records shall be kept for each test showing the date, system and/or equipment was tested, method of test, test results and approval signature of the OWNER. Three copies of the test records, along with any certificates of final inspection

or approval issued by the authorities having jurisdiction, shall be furnished to the OWNER at the successful completion of each test.

B. Commissioning

1. Pipe lines shall be put in operation upon successful testing and upon authorization by the OWNER's Representative.

C. Final Clean Up; Site Rehabilitation

1. Before finally leaving the site, the CONTRACTOR shall wash and clean all exposed surfaces which have become soiled or marked. CONTRACTOR shall remove from the site of the work all accumulated debris and surplus materials of any kind which result from his operations, including construction equipment, tools, sheds, sanitary enclosures, etc. CONTRACTOR shall leave all equipment, fixtures and work, which he has installed, in a clean condition. The completed project shall be turned over to the OWNER in a neat and orderly condition.

2. The site of the work shall be rehabilitated or developed in accordance with other Sections of the specifications and the Drawings. In the absence of any portion of these requirements, CONTRACTOR shall completely rehabilitate the site to a condition and appearance equal or superior to that which existed just prior to construction, except for those items whose permanent removal or relocation was required in the Contract Documents or ordered by the OWNER.

D. Final Inspection

1. Final cleaning and repairing shall be so arranged as to be finished upon completion of the construction work.

2. The ENGINEER will make his final inspection of the work during the progress of final cleaning and repairing, and any portion of the work finally inspected and accepted by the ENGINEER shall be kept clean by the CONTRACTORs, until the final acceptance of the entire work.

3. When the CONTRACTORs have finally cleaned and repaired the whole, or any portion of the work, they shall notify the ENGINEER that they are ready for final inspection of the whole or a portion of the work, and the ENGINEER will thereupon inspect the work. If the work is not found satisfactory, the ENGINEER will order further cleaning, repairs or replacement.

4. When such further cleaning or repairing is completed, the ENGINEER, upon further notice, will again inspect the work. The "Final Payments" will not be processed until the CONTRACTOR has complied with the requirements set forth and the ENGINEER has made his final inspection of the entire work and is satisfied that the entire work is properly and satisfactorily constructed in accordance with the requirements of the Contract Documents.

End of Section

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SECTION 01700

RIGHTS OF WAY

PART 1: GENERAL

1.01 The proposed construction activities and appurtenances shall be installed along rights of way under the jurisdiction of the OWNER, PA Department of Transportation, CSX Railroad, City of McKeesport, and the Boroughs of Liberty and Port Vue. The OWNER has, or will have, a acquired the necessary rights of way for construction of the proposed facilities, however, if the CONTRACTOR desires ingress or egress to the construction site over private properties or land for which the OWNER obtained no such rights of way, the CONSTRACTOR shall make all necessary arrangements. Information regarding rights of way obtained from private property owners is available from the OWNER. Identification of property owners and the location of the respective property lines were obtained from various sources as noted on the plans, and may not be accurately or currently represented. The OWNER has acquired, in most cases, a temporary construction easement suitable for construction of the proposed facilities and a 20' wide permanent easement. The CONTRACTOR is cautioned to work only within the granted easements and to minimize the area of disturbance of his activities. A copy of all individual easement exhibits is available for the contractors so that they have knowledge of all easements and how they affect the work area.

1.02 The proposed construction activities may also encroach upon rights of way owned and occupied by the utility companies listed on the plans. Existing utility lines are indicated on the Drawings at locations which have been determined from either field markers or from records on file in the respective utility offices. CONTRACTORS shall conduct the construction work very carefully to avoid disturbance of those utility lines and shall advise his personnel (and those of any subcontractor) the hazards inherent in working near underground gas lines and/or overhead high voltage electric lines. Any and all damages caused to existing utility lines, or resulting from the exposure of, and contact with said lines or from other construction activities, shall be rectified by that CONTRACTOR which is responsible for same.

PART 2: PRODUCTS

A. Not used.

PART 3: EXECUTION

A. Not used.

End of Section

SECTION 01740

CLEAN UP OF WORK SITE

PART 1: GENERAL

1.01 Immediately after all construction operations have been completed on any section, the CONTRACTOR shall thoroughly clean the area of all excess materials, debris, plant and equipment for which he is responsible. The OWNER's Project Representative will designate and fix the limits of each "section" of construction area in the field, under each contract for clean-up purposes. While it is intended to cooperate with the CONTRATOR in establishing such section limits, it shall be required that clean-up activities reasonably progress with construction progress. The determination of what is reasonable shall be made by the ENGINEER. The CONTRACTOR shall also restore to its original condition and to the satisfaction of the OWNER's Project Representative, all grounds, fences, lawns, driveways, streets, roadways, banks, ditches, and all other areas and shall leave the premises in a neat and operable condition.

1.02 All sewer lines and manholes shall be thoroughly flushed and cleaned and all dirt, construction materials, sediment and other materials shall be completely removed from the system prior to connection of all services and operation of the sewers.

PART 2: PRODUCTS

A. Not used.

PART 3: EXECUTION

A. Not used.

End of Section

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SECTION 01741

DUST AND MUD CONTROL

PART 1: GENERAL

1.01 Dust control palliatives shall be utilized where and when necessary to satisfactorily maintain roads, streets, alleys, berms and other traveled ways for vehicular traffic. In addition, the accumulation of mud and/or dirt from the excavation, backfill and trenching operations shall be cleaned off the surfaces of traveled ways by machines and/or hand labor as frequently as is necessary to properly maintain the roadways and minimize construction nuisance and traffic safety problems.

PART 2: PRODUCTS

A. Not used.

PART 3: EXECUTION

A. Not used.

End of Section

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SECTION 01800

SUBSTANTIAL COMPLETION

PART 1: GENERAL

1.01 The CONTRACTOR is hereby notified and alerted the Contract Technical Specifications are specific to construction of work specified herein, with site restoration throughout the whole of the work area, and to that end, the interpretation for Substantial Completion for this Contract is a point where the whole of the work for all items specified in Division 1 through Division 16 inclusive, herein, of all restoration and punch list items are completed to the satisfaction of the OWNER.

PART 2: PRODUCTS

A. Not used.

PART 3: EXECUTION

A. Not used.

End of Section

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PART 2:

DIVISION 2 - SITE WORK

SECTION 02000

SITE WORK

PART 1: GENERAL

A. Under this Division the CONTRACTOR shall furnish complete all materials, labor, plant, utilities and equipment necessary to perform work related to clearing, excavation, backfill, site drainage, and site restoration work, all as shown on the drawings or specified.

1.02 WORK INCLUDED

A. All work shall be performed in accordance with the requirements of the Contract Documents and the General Conditions of the specifications and all materials and equipment furnished shall conform to those descriptions and requirements. All work shall be constructed complete.

B. The CONTRACTOR shall be responsible and liable for all property damage and bodily injury that may result from his damaging or disturbing any structures, facilities, utility or process pipe lines, electric conduits, sewers, etc., and for all damages incurred as a result of his construction activities. He shall restore same to their original condition as soon as is reasonably possible after such damage is incurred.

PART 2: PRODUCTS

A. Not used.

PART 3: EXECUTION

A. Not used.

End of Section

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SECTION 02040

SITE PREPARATION

PART 1: GENERAL

A. The CONTRACTOR shall clear the site and otherwise prepare the site for the construction shown on the drawings and specified herein. The CONTRACTOR shall make such alternative arrangements as may be necessary for the removal and disposition of the various brush, trees and other debris as are necessary. No such materials shall be included with any placement of fill and/or backfill, and all such materials shall be cleaned up, transported and removed from the site.

B. Before general excavation, all topsoil over the sites of excavation and/or backfill, shall be stripped and stored in a manner to minimize soil erosion until construction is completed. CONTRACTOR shall protect the surrounding site areas from soil erosion by installing fabric fence or straw bales at the perimeter of the area disturbed. Installation of straw bales and fabric fence and other erosion and sedimentation pollution control measures shall be in accordance with the requirement of the County Soil Conservation Service.

PART 2: PRODUCT

A. Not used.

PART 3: EXECUTION

A. Not used.

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SECTION 02140

DEWATERING

PART 1: GENERAL

1.01 WORK INCLUDED

A. The CONTRACTOR shall provide and maintain in operation suitable and adequate pumping and/or well point equipment for completely dewatering any and all excavations in such a manner as to permit the successful installation of the proposed improvements. No improvement shall be permitted to be constructed or installed in an excavation in which water flows or is pooled.

PART 2: PRODUCTS

A. Not used.

PART 3: EXECUTION

A. Not used.

End of Section

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SECTION 02150

SHORING

PART 1: GENERAL

1.01 WORK INCLUDED

A. The CONTRACTOR shall be responsible for the adequate sheeting, shoring, and/or bracing of any excavation required for the completion of his work.

B. Shoring, sheeting and bracing shall be according to all OSHA Standards and be designed by a registered professional engineer to withstand all loads superimposed thereon to protect existing or proposed structures, pipelines, or other facilities, or where required to prevent injury to personnel working in the excavation. All excavations which present a hazard to personnel working in the trench because of embankments, stockpiling of excavated materials along the top of the trench, etc., shall be provided with adequate sheeting, shoring and bracing.

PART 2: PRODUCTS

A. Not used.

PART 3: EXECUTION

A. Not used.

End of Section

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SECTION 02151

ANCHORING AND BLOCKING

PART 1: GENERAL

A. All Pressure Pipe Lines shall be adequately blocked and anchored to prevent the pipeline from pulling apart under pressure.

B. All bends in excess of 10 degrees, plugs, caps, tees, wye branches shall be blocked or anchored. Concrete blocking shall conform to the standards shown in the Standard Details SD-2-045 and SD-2-046.

C. Lugged fittings and tie rods, clamps, collars, restrained joints and anchoring fittings may be substituted in lieu of concrete blocking when specified in the Contract Drawing.

PART 2: PRODUCTS

A. See Concrete Section 03300.

PART 3: EXECUTION

A. Not used.

End of Section

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SECTION 02210

SUBSURFACE EXPLORATION

PART 1: GENERAL

1.01 SITE CONDITIONS

A. Limitations of Subsurface Information Indicated on Drawings:

1. Certain information regarding the reputed presence, size, character and location of existing underground structures, pipe lines and electrical and signal facilities has been indicated on the Drawings for the benefit of the OWNER. There is no certainty of the accuracy of this information, and the location of underground structures indicated may be inaccurate, and other obstructions than those indicted may be encountered.

2. The CONTRACTOR hereby distinctly agrees:

   a. That neither OWNER nor the ENGINEER is responsible for the correctness or sufficiency of the information given;

   b. That in no event is this information to be considered as a part of the Contract;

   c. That the CONTRACTOR shall have no claim for delay or extra compensation or damage against the OWNER or the ENGINEER on account of incorrectness of information given; or on account of insufficiency or absence of information regarding obstruction either revealed or not revealed by the Drawings; and

   d. That the CONTRACTOR shall have no claim for relief from any obligation or responsibility under the Contract, in case the location, size or character of any pipe, electrical or signal facility or other underground structure is not as indicated on the Drawings, or in case any pipe, electrical or

signal facility or other underground structure is encountered that is not indicated on the Drawings.

B. Digging Test Pits:

1. In locations where required by the ENGINEER, or indicated on the Drawings, dig test pits to determine the location and elevation of existing subsurface utility pipelines, electrical facilities or structures. Dig such test pits in the presence of an authorized representative of the OWNER of the subsurface utility pipelines, electrical facilities or structures. The CONTRACTOR is further advised that no excavation, pipe laying or other work is permitted at above referenced locations without the presence or approval of an authorized representative of the OWNER of the subsurface utility.

2. Digging test pits in locations required by the ENGINEER or indicated on the Drawings will be classified as Miscellaneous Unclassified Excavations and Backfill.

3. Test pits or other miscellaneous excavation dug to obtain information on subsurface conditions or underground obstructions without written requirement of the ENGINEER will be at the CONTRACTOR's expense.

4. Each test pit excavation shall be assumed to be 10 feet long by 8 feet deep by 2 feet wide minimum.

C. Air/Vacuum Test Hole Subsurface Utility Location

1. In locations required by the ENGINEER or indicated on the drawings, the CONTRACTOR shall locate buried utilities by means of non destructive digging equipment insuring the integrity of subsurface utility lines as no hammers, blades or heavy mechanical equipment shall come in contact with the utility is uncovered and the location and elevation is determined.

2. Each Air/Vacuum Excavation shall be assumed to be 10 feet long, 5 feet deep by 2 feet wide.

3. Required by the ENGINEER or indicated on the Drawings will be classified as Miscellaneous Unclassified Excavations and Backfill.

4. Excavations to obtain information on subsurface conditions or underground obstructions without written requirement of the ENGINEER will be at the CONTRACTOR's expense.

PART 2: PRODUCTS

A. Not used.

PART 3: EXECUTION

A. Not used.

End of Section

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SECTION 02220

EXCAVATING, BACKFILLING, AND COMPACTING

PART 1: GENERAL

1.01 WORK INCLUDED

A. The CONTRACTOR shall make personal examination of the site in which the improvements are to be installed and determine for himself the extent and character of any work that may be encountered. All excavations shall be unclassified and no extra payment will be made for hand excavation or for rock, shale, masonry, etc., encountered in construction. There shall be no blasting on this project.

B. The CONTRACTOR shall provide adequate and suitable means of shoring and/or bracing to prevent failure of any excavation wall and to protect his personnel working in the excavation.

C. All open excavation which presents a hazard to personnel or equipment on the construction area shall be adequately barricaded and posted with battery operated warning lights, signs, etc., as required by any local, state or federal regulations governing same, or by any published company policy or regulation of the OWNER.

D. Should the CONTRACTOR's operations impair foundations for new or existing structures, he shall provide Class C concrete underpinning piers or supports for such structures at no additional cost to the OWNER.

E. No frozen or excessively wet material will be permitted to be used as backfill. Suitable or selected backfill material shall be kept separated from the unsuitable types. If the CONTRACTOR allows suitable backfill material from his excavation to become frozen or excessively wet or mixed with unsuitable material, he shall not be allowed to use it as backfill material and he will be required to bring in material from an outside source at no additional cost to the OWNER.

F. All excavation materials not used in backfill, or final grading operations shall be hauled from the site and disposed of by the CONTRACTOR at his own expense. He shall not dispose of such material on the site of the work without the permission of the OWNER.

PART 2: PRODUCTS

A. Not used.

PART 3: EXECUTION

3.01 EXCAVATION AND BACKFILL FOR STRUCTURES

A. Excavation for all structures shall be made to the lines and grades as shown on the plans, and in the case of concrete structures, the excavation shall be made far enough from the final lines of the structure to afford ample room for setting and removing forms for dewatering purposes and for other construction needs.

B. Machine excavation shall be permitted to within 3 inches of the bottom of footings, floors and foundations but the final 3 inches shall be shaped with hand shovel to insure attainment of correct final grades which are free from loose, shattered, spongy, or other unsatisfactory foundation conditions. Any foundation areas which are overcut or disturbed by the CONTRACTOR's operations shall be cleaned and backfilled to foundation grade with concrete conforming to these specifications.

C. Excavation for manholes or similar structures may be performed with non-vertical banks except where such excavation will undermine adjacent facilities or structures, or where such excavation will violate private property outside the property lines established for this work. All inlets and discharge piping within the area of the manhole excavation shall be installed in concrete cradle and the cradle shall extend a minimum of three feet and as far into the pipe trench as necessary to protect the pipe to where standard trench conditions are reached.

D. Backfill around structures shall not be placed until approval is received from the OWNER's representative

at the site. No backfill will be permitted to be placed against newly poured concrete walls until the concrete has attained the specified 28-day strength. Backfill around structures shall be placed uniformly in successive layers around the entire structure to preclude the possibility of nonuniform loading for the exterior wall. In this regard, the maximum permissible differential elevation of backfill at any one time will be four feet.

E. Backfill around all structures and in all trenches shall be carried to the grade indicated on the drawings or to that grade indicated on the drawings or to that grade existing before the installation of the improvement, unless otherwise indicated on the drawings or specified hereafter.

F. Compaction of the backfill around structures shall be accomplished by the use of adequately weighted rollers except that within three feet of any building wall, only approved mechanical tampers shall be used. Backfill material which is to be rolled shall be spread and compacted in layers not to exceed eight inches (compacted thickness). Rollers shall be of a design approved by the OWNER's representative at the site. The thickness of the layers of backfill material which are spread by bulldozer and compacted by the bulldozer tracks, or which are to be tamped in place shall not exceed four inches. No stones larger in any dimension than the thickness of the compacted layers specified will be permitted in the backfill material. Fill areas and trench backfill under roadways shall be compacted to Proctor Density of 95%.

3.02 OPEN EXCAVATION

A. Except where otherwise shown on the plans, all pipelines shall be constructed in open trenches. All excavation shall be unclassified and no extra payment will be made for rock, boulders, shale, timbers, logs, old foundations, masonry, or other natural or artificial materials encountered in the trenching operations. There shall be no blasting.

B. The depth of trenches shall be such that the location of the proposed pipes will conform with the lines and grades shown on the plans or as revised and

established by the OWNER's representative in the field during construction. The shape of all trenches above the pipe zone, trench sidewall supports both above and within the pipe zone, the construction methods employed, the general protection requirements, the general excavation requirements, the general trenching requirements, and the minimum requirements for trench shoring, shall conform with the regulations set forth under Subpart P, "Excavation, Trenching and Shoring" published as part of the Safety and Health Regulations for Construction by the U. S. Department of Labor, as amended. No trenching excavation work shall be performed which is not in accordance with those regulations.

C. The shape of the trenches in the "pipe zone" (which shall be construed to be that portion of the trench between the trench bottom and an elevation 1 foot above the top of the pipe), shall conform to the configuration identified as "Typical Bedding" on the contract drawing. The CONTRACTOR is herein advised that if trench widths in the pipe zone exceed the outside diameter of the pipe plus two feet, and if the OWNER's representative determines that such excessive widths will result in structural loadings for which the pipe is not designed, he shall be required to bed the pipe on concrete cradle as directed by the OWNER's representative at no additional cost to the OWNER.

D. The CONTRACTOR shall shape trenches which are located adjacent to existing aboveground or underground structures and/or facilities or in other confined areas, so that such structures and facilities are properly protected against damage or disturbance from settlement or displacement. Adequate sheeting, shoring and/or bracing shall be installed and maintained to provide such protection and the CONTRACTOR shall be responsible for all damages resulting to such proposed and existing structures, pipelines, and/or facilities as the result of his failure to use and maintain adequate trench wall supports, as well as a result of any other construction activities. The bottoms of all trenches shall be excavated to a depth of 0.5 ft. below the bottom of the proposed lines to accommodate the bedding hereinafter specified.

E. Materials excavated from trenches shall be stored or deposited within the rights-of-way established for this work, unless the CONTRACTOR secures, in writing, permission from adjacent property owners to use their property for this purpose.

F. Where muck, quicksand, soft clay, swampy or other material is encountered in the trench bottom, which in the opinion of the OWNER's representative is unsuitable for pipe foundation subgrade or backfill, such material shall be removed to a depth satisfactory to the OWNER's representative. The trench shall then be backfilled to grade with acceptable material, mechanically compacted in successive layers. For the removal and replacement of such unsuitable materials, to a depth greater than the 6" below the bottom of the pipe, and when authorized by the OWNER's representative, the CONTRACTOR shall be reimbursed on the basis of the invoiced unit cost of the delivered material times the actual measured unit quantity installed times a multiplier of 1.15.

G. The OWNER's representative may require that sheeting, shoring and/or bracing installed for trench excavation be left in place in order to protect adjacent facilities or structures. Where such is not required in the Detailed Specifications, or in the Plans, the CONTRACTOR will be reimbursed in accordance with the Changes of Contract Price section of the General Conditions. All other sheeting may be salvaged when the removal of same will not present a hazard to the adjacent facilities or to the safety of the CONTRACTOR's personnel. The CONTRACTOR shall be fully responsible and liable for any improper or premature removal of sheeting, shoring or bracing and any and all personnel or property damages resulting therefrom.

H. The depth of trench for pipelines shall be such that pipe in its installed position will comply with the lines and grades shown on the plans, or as revised and established by the OWNER's representative in the field during construction.

3.03 PIPE BEDDING AND PIPE ZONE BACKFILL MATERIAL

A. Where rock is encountered at the bottom of the trench and where ductile iron and flexible material pipelines are installed, piping shall be supported on a granular material such as 2B limestone or 2B gravel complying with the gradation and classification of the Pennsylvania Department of Transportation or similar material approved by the OWNER's representative with a minimum depth of 0.5 ft. below the bottom of the pipe installed for the full width of the trench. For flexible pipe, said material shall further be required to be placed in the entire pipe zone area of the trench to an elevation 1 ft. above the top of the pipe. For ductile iron pipe the bedding material shall extend to the pipe spring line. No slag material is permitted. The bedding and backfill material shall then be choked as required by the OWNER's representative with approved material in sufficient quantities to prevent the migration of surrounding soils into the bedding and backfill. The material shall be placed in the pipe zone in such a manner as to not disturb, displace, or otherwise misalign the installed lines. Bedding material shall be installed to support precast concrete manholes and precast concrete vaults.

3.04 BACKFILL MATERIAL ABOVE THE PIPE ZONE

A. Backfilling of trenches located under the proposed building and in roadways, parking areas, driveways and other traveled ways shall be backfilled between the pipe zone and the base of the roadway or structure with approved crushed stone material. No slag material shall be permitted as select backfill material.

B. The CONTRACTOR shall limit daily trench excavation to a length of pipe placement and backfilling that can be completed the same day.

C. The width of all trenches shall not exceed the maximum of four feet or the pipe diameter plus two feet, as measured from the bottom of the respective pipe trench to a horizontal plane located one foot above the top of pipe. In the event that the CONTRACTOR's construction methods/activities result in a trench wider than the pipe diameter plus two feet within that pipe zone, he

shall install concrete bedding or encasement or shall make such other provisions as may be directed by the ENGINEER to assure the structural integrity of the pipe. Where excavation exposes the bottom of proposed trenches where very soft or other unstable pipe foundation materials exist, the CONTRACTOR will be directed to overcut or stabilize/overcut and the CONTRACTOR shall be compensated for the additional excavation in accordance with the provisions specified in the General Conditions. Polyvinylchloride sewer pipes and ductile iron pipe having restrained joints shall be installed at the locations identified in the contract drawings on bedding material with a minimum depth of 6", which material shall conform to the specifications set forth hereinafter.

D. The material excavated during trenching and other construction operations shall be used as backfill at locations where there is no permanent improvement. Said material shall be used for the full depth of trench to the finished ground surface where the ground is unimproved. At all locations, the entire depth within the backfilled area shall be thoroughly compacted in layers. Backfill material in trenches above the pipe zone at all locations, shall be placed in lifts not exceeding eight inches in thickness and shall be thoroughly and mechanically compacted by the use of vibratory or reciprocating tamping equipment or may be placed in lifts not exceeding three feet in thickness and shall be thoroughly and mechanically compacted by use of vibratory hoe pack for the full depth of trench. Special backfill material (select backfill is required in trenches under existing streets, alleys, roads, traveled ways, road shoulders or berms and driveways. In the event that the CONTRACTOR desires to employ the use of special vibratory and/or heavy duty machinery for that purpose, such methods will be approved by the OWNER's representative, subject to demonstration by the CONTRACTOR that satisfactory end results can be attained.

E. Unsatisfactory trench settlements occurring within 18 months after completion of the work shall be the responsibility of the CONTRACTOR at no extra cost to the OWNER.

3.05 EMBANKMENT AND FILLS

A. Fill Procedures

1. Embankments and fills to be included in this work shall be constructed to the lines and grades shown on the plans.

2. Where newly placed material abuts old material in the embankment, the old material shall be cut or broken by discing, plowing, scarifying or bull-dozing until it shows the characteristic colors of undried material. The bulldozer shall then work on both old and new material in such a manner as to thoroughly bond them together.

3. During the dumping and spreading operations of the materials for the embankment or fill, the CONTRACTOR shall maintain at all times a force of men sufficient to remove roots, grass, trash and branches from the rolled fill section and these materials shall be removed from the embankment and burned or otherwise disposed of in a manner satisfactory to the ENGINEER.

4. The surface of the fill or embankment shall have the optimum water content required for compaction, as determined by the CONTRACTOR's soils expert.

5. The fill and/or embankment shall be built up in approximate horizontal layers of the maximum thickness indicated in the compaction method or method hereafter specified across its full length and width. The layers shall be spread uniformly and shall have a slope of approximately 1% to the outside of the embankment to facilitate surface drainage during placement operations.

6. The entire surface of the embankment or fill shall be maintained at all times in such a condition that construction equipment can travel over any part and at no time shall separate pieces of equipment track each other.

7. Compaction shall be accomplished by one of the following methods, the first of which shall be used where practical and possible.

B. Compaction Method No. 1

1. Fill material shall be spread in uniform layers not to exceed 6" after compaction.

2. Tamping rollers having staggered, uniformly spaced knobs and equipped with suitable cleaners, shall be used for compacting each layer. The projecting face area of each row and the number and spacing of the knobs shall be such that the total weight in pounds of the roller and ballast, if distributed over the equivalent area of one row of knobs parallel to the axis, will not be less than 250 pounds per square inch and preferably not more than 500 pounds per square inch. Each layer of material shall be compacted by passing the specified roller over the entire surface the number of times required to obtain 50% coverage as determined by the size and spacing of the roller feet or knobs, and assuming that no part of the layer being compacted is covered by a roller knob more than once.

3. If, in the opinion of the ENGINEER, additional rolling is required to obtain optimum compaction, the CONTRACTOR shall perform the same at no additional cost to the OWNER. The design and operation of tamping rollers shall be subject to the approval of the ENGINEER and he shall have the right at any time during the prosecution of the work to direct such alterations or repairs as may be found necessary to secure the optimum compaction of the earth fill materials.

C. Compaction Method No. 2

1. Fill material shall be spread in uniform layers not to exceed 4 inches after compaction. The CONTRACTOR will be permitted to employ a heavy bulldozer for spreading such material. The bulldozer shall weigh not less than 10 tons and be equipped with cleated tracks. In compacting the embankment, the bulldozer tracks or treads

shall cover the entire surface of each layer at least once. Compaction of the embankment with the bulldozer shall continue until the maximum compaction has been secured.

D. Compaction Method No. 3

1. This method is intended for use only in confined areas too small for the use of tamping rollers or bulldozers. Material shall be spread in layers not to exceed 4" depth before compaction and then thoroughly compacted by means of mechanical tamping. Hand tamping will not be approved as a substitute for mechanical tamping.

2. It is contemplated that this method shall be used in pipe trenches, under and around pipe passing through embankments and to heights of 2 feet above such pipe, and adjacent to manholes and structures. Particular care shall be taken in these areas to obtain compaction at least equal to that obtained by Method No. 1 of the previously specified methods.

End of Section

SECTION 02230

RIP RAP

PART 1: GENERAL

1.01 DESCRIPTION

A. Section includes Requirements, Procedures, and Methods related to installation of dumped stone Rip-Rap Slope/Outfall Erosion Protection Devices.

B. Rock Rip-Rap includes the use of filter and bedding aggregates, Geotextile and Foundations where applicable.

C. It is the intent of these specifications to produce a fairly compact Rip-Rap protection in which all sizes of material are placed in their proper proportions. Hand placing or rearranging of individual stones by mechanical equipment may be required to the extent necessary to secure the results specified.

D. At the locations indicated in the Contract Drawings, the CONTRACTOR shall place a protective covering of erosion resistant material on the slopes.

E. At locations identified on the Contract Drawings, grout shall be placed with the Rip-Rap so that all the voids between the rocks shall be filled. Maximum spacing between rocks shall be 2". Surface rocks shall be imbedded with grout from ½ to ⅔ of their maximum dimension.

1.02 SUBMITTALS

A. The sources from which the stone will be obtained shall be selected in advance of the time when the stone will be required in the work. The acceptability of the stone will be determined by service records and/or by suitable tests. If testing is required, suitable samples of stone shall be taken in the presence of the ENGINEER at least 10 days in advance of the time when the placing of rip-rap is expected to begin. The approval of some rock fragments from a particular quarry site shall not be construed as

constituting the approval of all rock fragments taken from the quarry

B. In the absence of service records, resistance to disintegration from freezing and thawing, stone shall be tested by ASSHTO Test 103, for ledge rock procedure A. The stone should have a loss not exceeding 10 percent after 12 cycles of freezing and thawing.

PART 2: MATERIAL

2.01 STONE RIP RAP

A. Stone used for the dumped Rip-Rap shall be hard, durable, angular in shape; resistant to weathering and to water action; free from overburden, spoil, shale and organic materials; and shall meet the gradation requirements for the class specified. Neither breadth nor thickness of a single stone should be less than one-third its length. Rounded stone or boulders will not be accepted unless authorized by special provisions. Shale and stone with shale seams are not acceptable.

B. Stone shall be free from overburden, spoil, shale and organic material. Each load of Rip-Rap shall be reasonably well graded from the smallest to the maximum size specified. Stones smaller than the specified 10 percent size and spalls will not be permitted in an amount exceeding 10 percent by weight of each load.

C. The minimum weight of stone shall be 155 pounds per cubic foot as computed by multiplying the specific gravity (bulk saturated, surface dry basis, ASSHTO Test T 85) times 62.3 pounds per cubic foot.

D. The Rip-Rap shall meet National Crushed Stone Association (NSA) requirements and shall be placed on a filter blanket.

E. Rip-Rap sizes are identified in the Contract Drawings.

2.02 FILTER STONE BLANKET OR BEDDING

A. As required, and as shown in the project drawings the CONTRACTOR shall install bedding materials to prepare

the subgrade and/or protect the geotextile, prior to placement of rock.

B. Filter stone shall meet NSA Filter Stone Requirements.

C. Filter stone sizes are identified in the Contract Drawings.

2.03 GEOTEXTILE

A. Geotextile product shall be composed of polypropylene materials for stabilization applications, and meet AASHTO M288-92, requirements for woven high survivability separation fabrics. The fabric shall be inert to biological degradation and naturally encountered chemicals, alkalis, and acids.

B. For Rip-Rap R-4 and smaller, CONTRACTOR shall supply material meeting PennDot's Publication 408 geotextile requirements Class II, Type B.

C. For Rip-Rap R-5 and larger, it shall meet Type A of the same requirements.

D. Product shall be TNS W280 Woven Fabric for Type B and TNS W200 Woven Fabric for Type A manufactured by TNS Advanced Technologies or equal.

PART 3: EXECUTION

3.01 GENERAL

A. Slopes and areas to be protected by Rip-Rap shall be free of brush, trees, stumps and other objectionable materials and be dressed to a smooth surface. All soft or spongy material shall be removed to the depth shown on the plans or as directed by the ENGINEER and replaced with approved material.

B. Stone for Rip-Rap shall be placed on the prepared slope or area in a manner which will produce a reasonably well graded mass of stone with the minimum practicable percentage of voids. The entire mass of stone shall be placed so as to be in conformance with the lines, grading and thickness shown on the plans. Rip-rap shall be placed to its full course thickness as one operation and in such a manner as to avoid

displacing the underlying material. Placing of Rip-Rap in layers, or by dumping into chutes, or by similar methods likely to cause segregation will not be permitted.

C. The larger stones shall be well distributed and the entire mass of stone shall conform to the gradation specified. All material going into Rip-Rap protection shall be so placed and distributed that there will be no large accumulations of either the larger or smaller sizes of stone.

3.02 SUBGRADE PREPARATION

A. Prior to the placement of rock Rip-Rap, filter aggregate, bedding or geotextiles, the subgrade surfaces shall be cut, filled, compacted and graded to the lines and grades as shown on the project drawings. All subgrade surfaces shall be prepared so as to be reasonably smooth, and free of mounds, dips, or windows.

B. The placement of fill to meet design grades and elevations shall be of an approved material, and placement shall include adequate compaction of the materials as set forth in Construction Specification.

C. No Rip-Rap, filter/bedding aggregate or geotextile shall be placed until the subgrade is inspected and approved by the Project ENGINEER. The subgrade shall be of a depth that provides finished grades to match the pre construction grades at stream crossings.

D. As shown on the project drawing, The CONTRACTOR shall provide for an adequate foundation under the rock Rip-Rap. Where unstable soils (i.e clays/silts) are present, a geotextile and gravel foundation may be required to prevent settling of the Rip-Rap.

3.03 DUMPED & PLACED ROCK RIP-RAP

A. The rock Rip-Rap shall be placed by equipment on the surfaces and to the depths specified. The rock Rip Rap shall be installed to the full course thickness in one operation and in such a manner as to avoid displacement of the underlying subgrade, filter/ bedding aggregate or geotextile.

B. The rock for Rip-Rap shall be delivered and placed in such a manner that will insure that the Rip Rap in-place, will be reasonably homogeneous with the larger rocks informally disturbed and firmly in contact with the smaller rocks and spalls filling the voids between the larger rock. Hand placement of chinking stone shall be completed in insure a final surface which is smooth.

C. At both the upper and lower limits of the rip-rap section, the rock Rip-Rap shall be keyed into the stable bank providing protection from erosion getting behind the Rip-Rap blanket. The rock Rip-Rap shall be placed to an elevation which is below the design streamed elevation. Rock Rip-Rap will be placed starting at the lowest elevation of a toe trench as shown on the drawings.

End of Section

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SECTION 02246

HORIZONTAL DIRECTIONAL DRILLING

PART 1: GENERAL

1.01 WORK INCLUDED

A. The work specified in this section consists of furnishing and installing underground utilities using the directional boring (horizontal directional drilling, HDD) method of installation, also commonly referred to as guided horizontal boring. This work shall include all services, investigations, equipment, materials, and labor for the complete and proper installation, testing, and restoration of underground utilities, environmental protection and restoration.

B. It is the intent of this specification section to serve as a guideline for the acceptable methods and minimum requirements for methods, materials and equipment used for the horizontal directional drilling for the substantially trenchless construction of pipelines.

1.02 RELATED WORK

1. Temporary Erosion and Sediment Control, Section 01570
2. Pipe Line Commissioning, Section 01651
3. Subsurface Exploration, Section 02210
4. Excavation, Backfilling and Compaction, Section 02220
5. Specification 02620 - High Density Polyethylene Piping
6. Soil Treatment, Section 02910

1.03 REFERENCES

A. This section references the following documents that are considered part of this section as specified:

1. "Subsurface Exploration and Geotechnical Engineering Analysis" prepared by ECS Mid-Atlantic, LLC (Amended April 20, 2009), appended to these specifications.

2. ASTM F-1962 "Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacles, Including Rivers".

3. ASTM D-3261 HDPE Welding Code.

B. In case of conflict between the requirements of this section and those of the listed documents, the more stringent requirement shall prevail except in the case of stipulations required of regulatory permits.

1.04 QUALITY ASSURANCE

A. The requirements set forth in this document specify a wide range of procedural precautions necessary to insure that the very basic, essential aspects of a proper directional bore installation are adequately controlled. Strict adherence shall be required under specifically covered conditions outlined in this specification. Adherence to the specifications contained herein, or the Engineer's approval of any aspect of any directional bore operation covered by this specification, shall in no way relieve the CONTRACTOR of their ultimate responsibility for the satisfactory completion of the work authorized under the Contract.

B. The OWNER's representative will be on site full time during construction and assess the performance of the Contractor's field methods with respect to the intent of the approved CONTRACTOR's submittals. The CONTRACTOR will permit access to the work site for the OWNER's representative and provide, as requested, incremental drilling and tracking data and other project field data to the OWNER's representative.

1.05 EXPERIENCE

A. The horizontal directional drilling shall be performed by the drilling company who is experienced in the installation of sewer pipelines utilizing the horizontal directional drilling method for a minimum of five (5) years.

B. The CONTRACTOR shall submit data on the horizontal directional drilling company's experience.

1. The CONTRACTOR shall have installed directionally drilled pipe at least as large as 20 inches in diameter, have performed river crossings at least 2,000 feet in length, and successfully installed at least 100,000 feet in length via directional drilling.

2. The drilling company shall provide an installation list including the following information: City or District, project name and location, contact person and phone number, contract amount, project environment (river crossing, urban area), date of installation, pipe diameter, pipe material, maximum length of each bore, and total length of directional drilling.

C. The CONTRACTOR shall identify and submit information on the key personnel to be involved with the project.

1. Directional drilling and pipe installation shall be done only by an experienced key personnel specializing in directional drilling and who have at least five (5) years experience in this work.
2. No changes in the key staff shall be permitted without prior written request by the CONTRACTOR and approval by the OWNER.
3. The Key staff shall be on-site fulltime during all drilling operations.
4. The CONTRACTOR shall also submit a list of any subcontractors to be utilized within the CONTRACTORs activities.

1.06 PROJECT CONDITIONS

A. Refer to instructions to bidders and the Geotechnical Engineering Report.

B. The CONTRACTOR must also attend all pre-construction and project meetings as required by the OWNER and/or ENGINEER.

C. Upon the award of the contract the CONTRACTOR shall be provided with a digital version of the contract drawings for the purpose of preparing work plans and record drawings.

D. The ENGINEER will designate one pair of intervisable survey control points within 200 feet of the drill site that can be relied on for the CONTRACTOR to utilize as location and elevation for staking out the the entrance and exit points as identified on the construction drawings using coordinates provide by the ENGINEER. All pilot hole tracking and related survey will be the responsibility of the Specialty Tracking Contractor. All other surveys necessary for the project shall be the responsibility of the CONTRACTOR.

E. Comply with all state and local permit requirements and contractor registration requirements.

F. Make all necessary arrangements and include in the bid all cost for obtaining water.

G. Install and maintain all erosion and sediment pollution control devices. CONTRACTOR shall be responsible for all fines to OWNER as a result of his work activities.

H. Make all necessary arrangements and obtain all permits and include all cost necessary for transportation and off-site disposal of excess bentonite slurry, cuttings, and pit spoils.

I. Clean all debris or other material dropped onto paved roads during the disposal process to the satisfaction of the OWNER's representative.

J. Work hours for running equipment are not restricted.

K. The work assembly area at the entry point is delineated on contract drawings. All work and parking for personnel shall be restricted to the area delineated on the project drawings.

L. Work at the exit point is delineated on contract drawings. All work at the exit shall be restricted to the area delineated on the project drawings.

M. The CONTRACTOR shall coordinate all activities with the OWNER'S representative as necessary to keep the schedule.

N. The CONTRACTOR shall coordinate access and delivery issues with all other Contractors involved with mutually exclusive work adjacent to the work site as well as regulatory agencies for inspection purposes.

O. Access to work site and all associated deliveries shall be limited to the rights of way obtained by the OWNER.

1.07 SUBMITALS

A. WORK PLAN

1. Prior to beginning work, the CONTRACTOR must submit to the ENGINEER a general work plan outlining the procedure and schedule to be used to successfully execute and complete the project. The Work plan shall be thoughtfully developed, comprehensive, realistic and based on actual working conditions for this particular project.

2. At a minimum the work plan shall consist of working site drawings prepared by the CONTRACTOR and written procedure describing in detail proposed materials and methods and entire operation for information only including, but not limited to:

a. A list of personnel in accordance with paragraph 1.05 of this specification.

b. A schedule of work activity

c. A scaled proposed work site plan drawing identifying the size, capacity and arrangement of all equipment, material storage and environmental proposed to execute the plan.

d. Location and size of drilling and receiving pits.

e. Dewatering and methods of removing spoils material.

f. The entrance and exit angles, bend radii, setback distances

g. Pilot hole drilling, and back reaming procedures and equipment and methods.

h. Type of cutting head proposed for use.

i. Method of installing detection wire and pipe.

j. Type, location and method of installing locator station.

k. Method of pipe segment fusion and type of equipment utilized.

l. The location for the pre-installed pipe string (and rollers, if required)

m. Method of monitoring and controlling line and grade.

1). Detection of surface movement.

n. A Drilling Fluid Plan, which details for information only:

1). Products information, material specifications, and handling procedures.
2). Material safety data sheet and special precautions required.
3). Method of mixing and application
4). Estimated flow rates and pressures.
5). Cleaning and recycling equipment,
6). Procedures for minimizing drilling fluid escape
7). The estimated volume of excavated materials
8). Methods for circulation, containment, reclamation and final disposal of waste drilling fluids.

o. Pipe in accordance with the Specification Section 02620 in this document

p. Pulling procedures.

q. Maximum installation force on the pipeline

r. The calculated maximum tensile load permissible to be applied to the pipe during installation.

s. Testing methods and equipment

t. An environmental protection plan.

u. Inadvertent Return Plan

v. Contingency plans including but not limited to:

1). Unclassified subsurface obstacles encountered during the drilling process
2). Lost position of drill heads
3). Loss of bore hole stability
4). Subsidence of surfaces along the drill path.
5). Abandoned drill paths.
6). Recovery of tools, lost pipe, etc.

w. Traffic control plan (as applicable)

B. All applicable progress records shall be submitted to OWNER as requested and/or upon the successful completion of the installation in accordance with the record keeping requirements of these specifications.

C. Record drawings shall be submitted reviewed and approved by the OWNER within 30 days upon the successful completion of the installation and prior to final payment. Record drawings shall be a requirement of substantial work completion.

1. The CONTRACTOR shall provide three (3) hard paper copies of the Record Drawings and one digital copy prepared in AutoCAD 2000 format or similar computerized drafting compatible format.

2. Record drawings shall at a minimum consist of and include:

A. As constructed entrance and exit points identified with coordinates consistent with PA State Plane Coordinate System, NAVD 1983.

B. Vertical alignment based upon the centerline of the "As-Drilled" path of the pilot hole.

C. Horizontal alignments based upon the As-Drilled" path of the pilot hole as measured and calculated by the CONTRACTOR.

D. The record drawing shall utilize the topographic information provided on the construction bid documents as backgrounds.

1.08 ALIGNMENT:

A. The proposed plan and profile installation locations are based on alignments to accommodate acquired easements, to avoid surface and subsurface obstructions, individual pipe segment length and industry standards for drilling radii, and sized to properly maintain operational flow velocities. The number of setups and the length of pipe installation per set up as shown on the Drawings is merely a suggested layout to achieve the alignment shown on the Drawings. The CONTRACTOR shall be ultimately responsible for determining the number of set ups required to install the pipe to the alignment shown on the Drawings. The number of setups shall be incidental to the work.

B. The CONTRACTOR may request changes to the proposed vertical and horizontal alignment of the installation between the location of the proposed entry and exit points. Proposed changes shall be submitted to the ENGINEER in writing and include detailed plan and profile drawings of the bore plotted at a scale appropriate for the crossing. Prior to executing the approved work plan with proposed alignment changes, the CONTRACTOR shall receive written approval from the OWNER/ENGINEER.

PART 2: PRODUCTS

2.01 EQUIPMENT UTILIZED

A. General

1. The directional boring equipment shall consist of a directional boring rig of sufficient capacity to perform the bore and pullback the pipe, a boring fluid mixing & delivery system of sufficient capacity to successfully complete the crossing, a guidance system to accurately guide boring operations and trained and competent personnel to operate the system.

2. All equipment shall be in good, safe operating condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of this project.

3. Equipment requiring calibration shall be done at the beginning of each workday to ensure the continued consistency and accuracy.

B. Boring System

1. Directional Boring Rig:

a. The directional boring machine shall consist of a hydraulically powered system to rotate, push and pull drill pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The machine shall be anchored to the ground to withstand the pulling, pushing and rotating pressure required to complete the crossing.

b. The hydraulic power system shall be self-contained with sufficient pressure and volume to power boring operations. Hydraulic systems shall be free of leaks.

c. The rig shall be equipped with a system to monitor and record maximum pull-back pressure during pull-back operations.

d. The rig shall be electrically grounded during boring and pull-back operations and there shall be a system to detect electrical current from the drill string and an audible alarm that automatically sounds when an electrical current is detected.

2. Bore Head:

a. The bore head shall be steerable by changing the head's rotation and shall provide the necessary cutting surfaces and boring fluid jets.

3. Mud Motors

a. If required, mud motors shall be of adequate power to turn the required boring tools.

4. Drill Pipe:

a. Drill pipe shall be of the appropriate material, size and type sufficient for the torque, longitudinal loads and fluid capacities contained in the CONTRACTOR's Work Plan to bore the pilot hole and sustain reaming and pullback activities at the required depth and radii.

5. Reaming Tools

a. Reaming tools shall consist of the appropriate material, size and type necessary to enlarge the pilot hole to a diameter slightly larger than the product pipe.

b. Reaming tools utilized in pull-back activities shall be equipped with swivel devices

c. Hydraulic or pneumatic pipe rammers or pullers may only be used if necessary and with the authorization of ENGINEER.

C. Guidance System

1. The Guidance System shall be of a proven type and shall be setup and operated by personnel trained and experienced with this system.

2. A Magnetic Guidance System (MGS) probe or proven gyroscopic probe and interface shall be used to provide a continuous and accurate determination of the location of the drill head during the drilling operation.

3. Conventional electromagnetic sound walkover system shall not be considered acceptable for drilling activities under water courses or where the subsurface terrain is populated with other utilities.

4. The guidance shall be capable of tracking at the maximum depth required and in any soil condition, including hard rock. It shall enable the driller to guide the drill head by providing immediate information to the tool face, azimuth (horizontal direction), and inclination (vertical direction). The guidance system shall be accurate to ± 2% of the vertical depth of the borehole at sensing position at depths up to one hundred feed and accurate within 5 feet horizontally.

5. The Operator shall be aware of any magnetic anomalies and shall consider such influences in the operation of the guidance system if using a magnetic system.

D. Boring Fluid (Mud) System

1. Boring FLUIDS: Drilling fluid shall be composed of bentonite clay, clean water and appropriate approved additives.

   a. Bentonite clays shall conform to the criteria published in latest edition of API Specifications 13A, Specification for Oil Well Drilling Fluids Material for fresh water drilling fluids.

b. Water shall be from a clean source with a pH of 8.5 - 10. Water of a lower pH or with excessive calcium shall be treated with the appropriate amount of sodium carbonate or equal. The CONTRACTOR shall be responsible for transporting and storing any water required for drilling activities.

c. Additives to the drilling fluids such as drill soap, polymers, etc. shall be environmentally safe chemically inert, biodegradable and be approved for such usage and application prior to use. No hazardous or toxic additives shall be permitted.

d. The water and additives shall be mixed thoroughly and be absent of any clumps or clods. Boring fluid shall be maintained at a viscosity sufficient to suspend cuttings and maintain the integrity of bore wall.

e. At the request of the OWNER/ENGINEER, the CONTRACTOR shall be required to sample and monitor the waste drilling mud, cuttings and water at the CONTRACTOR's expense.

2. MIXING SYSTEM: A self-contained, closed, boring fluid mixing system shall be of sufficient size to mix and deliver boring fluid. The mixing system shall be able to molecularly shear individual bentonite particles from the dry powder to avoid clumping and ensure thorough mixing. The boring fluid reservoir tank shall have a capacity consistent with the requirements for the directional bore rig and the estimated flow of fluids required specific to the project. The mixing systems shall be required to continually agitate the boring fluid during boring operations.

3. DELIVERY SYSTEM: The mud pumping system shall have an adequate minimum capacity to deliver the boring fluid at the estimated flow rates and pressures identified in the CONTRACTOR's Work Plan. The delivery system shall have filters in-line to prevent solids recovered from cuttings from being pumped into the drill pipe.

Connections between the pump and drill pipe shall be relatively leak-free. Used boring fluid and boring fluid spilled during boring operations shall be contained and properly disposed by the CONTRACTOR. A berm, minimum of 12" high, shall be maintained around boring equipment, boring fluid mixing system, entry and exit pits and boring fluid recycling system (if used) to prevent spills into the surrounding environment. Pumps and or vacuum truck(s) of sufficient size shall be in place to convey excess boring fluid from containment areas to storage facilities.

E. Pipe Rollers

1. Pipe rollers shall be of sufficient size to fully support the weight of the pipe while being hydro-tested and during pull-back operations. A sufficient number of rollers shall used to prevent excess pipe sagging, dragging along the natural surface and minimize pull-back friction.

F. Other Equipment

1. Other devices or utility placement systems for providing horizontal thrust other than those previously defined in the preceding sections shall not be used unless approved by the ENGINEER prior to commencement of the work. Consideration for approval will be made on an individual basis for each specified location. The proposed device or system will be evaluated prior to approval or rejection on its potential ability to complete the utility placement satisfactorily without undue stoppage and to maintain line and grade within the tolerances prescribed by the particular conditions of the project.

2.02 PRODUCT PIPE

A. Refer to section 02620.

2.03 DETECTION WIRE

A. The pipelines installed by horizontal directional drilling (HDD) shall be installed with an electrically continuous tracer wire.

B. Detection wire installed with the product pipe shall be TW, THW, THWN, or HMWPE insulated copper, 10 gage or thicker wire.

PART 3: EXECUTION

3.01 GENERAL

A. All work shall be performed in accordance with the approved CONTRACTOR's work plan.

B. The ENGINEER shall be notified 48 hours in advance of starting work. The Directional Bore shall not begin until the OWNER's Representative is present at the job site and agrees that proper preparations for the operation have been made. The ENGINEER's approval for beginning the installation shall in no way relieve the CONTRACTOR of the ultimate responsibility for the satisfactory completion of the work as authorized under the Contract.

3.02 PRE-CONSTRUCTION SURVEYS AND PREPARTIONS

A. Prior to any alterations to work-site, CONTRACTOR shall photograph and video tape entire work area, including entry and exit points. One copy of which shall be given to ENGINEER and one copy to remain with CONTRACTOR for a period of one year following the completion of the project.

B. The CONTRACTOR shall accurately survey the entire drill path and shall place entry and exit stakes in the appropriate locations within the areas indicated on drawings. If CONTRACTOR is using a magnetic guidance system, drill path will be surveyed for any surface geo-magnetic variations or anomalies.

C. UTILITY LOCATION

1. The construction drawings identify all known existing utilities that are believed to be near the directional drill alignment. There is no guarantee that these utilities are located as shown or that the other utilities may not be present.

2. CONTRACTOR shall notify all companies with underground utilities in the work area via the state "one-call" to obtain utility locations.

3. Once the utilities have been located, the CONTRACTOR shall field verify the location and depth of all existing utilities, including service connections, to be paralleled or crossed prior to the start of directional drilling operations. The CONTRACTOR shall modify alignment, depth or grade as necessary to avoid utilities and minimize the number of peaks and valleys along the alignment.

4. The CONTRACTOR shall expose all utilities that they will be crossing with horizontal directional drilling. All major utilities (high pressure gas, fiber optic, high voltage electric, major pipe lines, water and sewer lines, etc.) should be exposed every 100 feet at minimum, if parallel within 5 feet of excavation area to verify depth and location of the utility. If the location is not accurate, the utility OWNER should be contacted immediately.

3.03 SITE PREPARATION

A. All work shall be performed within obtained rights-of-way and the CONTRACTOR shall confine all activities to designated work areas.

B. The CONTRACTOR shall provide erosion and sediment control measures consistent with the approved erosion and sediment control plan drawings of the bidding documents.

C. Additional environmental protection necessary to contain any hydraulic or boring fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures to prevent drilling fluid or borehole cuttings from entering the adjacent parcels to the construction limits.

D. The CONTRACTOR, at his discretion, shall verify soil type and characteristics identified in the appended geotechnical report, by any means up to and including digging test holes. Such explorations shall be

consistent with Section 02210 of these documents and will not warrant additional payment. Any and all information deviating from that supplied herein or on the contract drawings shall be disclosed to the ENGINEER immediately and prior to commencing the remainder of the work.

E. The Work sites as indicated on the construction drawings, shall be graded or filled to provide a level working area. No alterations beyond what is required for operations are to be made. All earthworks and fill materials shall comply with the requirements of Section 02220 of these specifications. All worksites shall be returned to their original grades and elevations unless otherwise directed by the OWNER/ENGINEER.

F. Provide installation and receiving pits as necessary for complete installation of the pipe. The CONTRACTOR shall minimize the number and size of the launch and receiving pits constructed.

3.04 PIPE CONSTRUCTION

A. Individual pipe segments shall be connected together in a single continuous length prior to pull-back operations, if space permits. If space is constricted the individual segments shall be joined in to no more than two (2) continuous lengths.

B. Pipe shall be connected in accordance with the manufacturer recommendations and in accordance with Specification Section 02620.

C. Pipe shall be placed on pipe rollers and or booms before pulling into bore hole with rollers/booms spaced close enough to prevent excessive sagging of pipe to avoid contact with the natural surface.

D. The pipe shall be laid out and assembled in a manner that does not obstruct adjacent public or private roads or activities adjacent to the layout areas except as otherwise shown.

E. The CONTRACTOR shall confine construction activities and disturbances within the areas shown on the Drawings. If the CONTRACTOR is specifically permitted

to use portions of right-of-way for staging, pipe layout and joining, the CONTRACTOR shall coordinate his operations so as not to impede or interfere with adjacent landowners or with the traveling public.

F. Where the butt fused pipe string is laid-out within the roadway right-of-way, the CONTRACTOR shall maintain access to public and private entrances and driveways at all times. Unless otherwise indicated, access may be maintained either by trenching and installing temporary culvert pipe for slip lining of the HDPE pipe, or by supporting the HDPE pipe aerially. Where aerial crossings are used, provide a minimum of 12 feet of clearance between the bottom of the HDPE pipe and the driveway. If commercial entrances or truck traffic are to be spanned, the CONTRACTOR shall allow adequate vertical clearance. The minimum bending radius for laying out and pulling the HDPE pipe shall be 60 times the pipe outside diameter.

G. The CONTRACTOR shall provide copies of written and signed agreements with adjacent property owners for any arrangements made by the CONTRACTOR for use of property outside of the rights-of-way and public property shown on the Drawings.

3.05 DIRECTIONAL DRILLING AND PULL-BACK

A. Pilot Hole

1. The pilot hole shall establish the horizontal plane of the pipeline.

2. The pilot hole shall initially penetrate the ground surface at the exact location intended. The angle of entry shall not exceed 75% of the allowable bending radius of the carrier pipe.

3. The CONTRACTOR shall provide and maintain instrumentation that will accurately locate the pilot hole and measure drilling fluid flow and pressure at all times.

4. The CONTRACTOR shall maintain accurate alignment and grade control and shall determine the pipe elevation (above mean sea level) at intervals not

exceeding 25 feet. Data feedback and electronic guidance systems shall be used to provide confirmation of position. The data generated by the downhole survey tools in a form suitable for independent calculation of the pilot hole shall be made available to the OWNER upon request by the CONTRACTOR during drilling activities.

5. This "as-drilled" plan and profile shall be updated as the pilot bore is advanced. Significant deviations between the design position and the actual position shall immediately be brought to the attention of the OWNER for discussion and/or approval. At no point in the drilled profile shall the radius of curvature of the bore be less than that indicated on the contract drawings.

6. Pilot hole shall be drilled on bore path with no deviations greater than 5% of depth over a length of 100'. In the event that pilot does deviate from bore path more than 5% of depth in 100', CONTRACTOR will notify ENGINEER and ENGINEER may require contractor to pull-back and re-drill from the location along bore path before the deviation.

7. The CONTRACTOR shall maintain close observations to detect settlement or displacement of surface and adjacent facilities. If settlement or displacement is detected, the CONTRACTOR is to immediately notify the OWNER and act to maintain safe conditions and prevent damage.

8. The CONTRACTOR shall notify the OWNER when forward motion of operation is stopped by an obstruction and provide options to overcome the obstacle. With the Owner's approval, another attempt to drill the pilot hole may be made or excavation at the obstruction to alleviate the blockage may be acceptable. Withdrawal, abandonment, and restarts shall be performed at no additional cost to the OWNER.

9. Exit Point Location - The pilot hole shall finally penetrate the ground surface within:

a. +/- 10 feet overall length tolerance and +/- 5 feet left/right alignment tolerance for directional drills of 1,000 linear feet, and
b. +/- 40 feet of overall length and +/- 5 feet left/right alignment tolerance for directional drills greater than 1,000 linear feet.

10. The alignment of the pilot bore must be approved by the OWNER's Representative before reaming and pullback may commence. If the pilot bore fails to conform to the above tolerances, the OWNER may, at his option, require a new pilot boring to be made.

B. Reaming

1. Upon successful completion and approval of the pilot hole and exit point locations by the ENGINEER, the reaming or enlarging phase of the installation shall begin. The borehole diameter shall be increased incrementally to accommodate the pullback operation of the product pipe using the appropriate tools.

2. During back reaming, drilling fluid shall be forced down the bore to stabilize the hole and to remove soil cuttings.

3. CONTRACTOR shall not attempt to ream at one time more than the boring equipment and mud system are designed to safely handle.

4. The type and sizes of back reamers to be utilized in this phase shall be determined by the types of subsurface soil conditions that have been encountered during the pilot hole drilling operation and previous back reams to achieve the required oversizing of the bore.

5. Normal oversizing shall be from 120 to 150 percent of the product pipe diameter. The design percentage oversize shall be field verified based upon pilot hole and previous back ream passes and shall be governed by the soil types, soil stability, depth, drilling fluid hydrostatic pressures, etc.

6. The CONTRACTOR shall carefully monitor the reaming operations to prevent damage to adjacent utilities.

C. Pull-Back

1. Pipelines pulled through boreholes shall be fitted with the appropriate caps to prevent foreign matter from entering the pipe.

2. As warranted, the pipe line may be filled with water to minimize buoyancy during pull-back operations.

3. Pipe shall be pulled by means of a Kellems grip, clevis fitting or an approved equivalent. The leading end of the pipe being pulled shall be fitted with an appropriately sized pulling swivel to prevent rotational torque from being transferred to the pipe.

4. The pipelines shall be adequately supported during installation to prevent overstressing or buckling. The CONTRACTOR shall provide adequate support/rollers along the stringing area to support the required length of the HDPE pipe. Such support/rollers shall be spaced at sufficient distance to prevent pipe from coming in contact with the ground. The rollers shall be comprised of a non-abrasive material arranged in a manner to provide support to the bottom and bottom quarter points of the pipeline allowing for free movement of the pipeline during pullback. Surface damage shall be repaired by the CONTRACTOR before pulling operations resume.

5. The CONTRACTOR shall pull detection wire, without splices, on top and along with the HDPE pipe.

6. Once pullback operations have commenced, the CONTRACTOR shall continue without interruption until the pipe is completely pulled into the bore hole.

7. The pipe shall be installed by continuously pulling and/or pushing the pipe into place

through the drilling fluid along the reamed bore pathway from insertion point to exit point without causing damage to the pipe and pipe joints being inserted.

8. The pullback speed shall be within the pipe manufacturer's recommendations.

9. During the pullback operation, the CONTRACTOR shall monitor roller operation and side booms, if required, to assist the movement of the carrier pipe. Proper pipe handling, cradling, bending minimization, and consistent insertion velocity shall be recorded.

10. Drilling fluid/lubricants shall be provided as required by the pipe manufacturer's recommendations and specifications to avoid stressing the pipe and joints past the materials elastic limits. Drilling fluid to be used to facilitate the installation of the pipe shall be adjusted within acceptable limits such that ground heaving and subsurface cavity formation through erosion are prevented.

11. The maximum pull (axial Tension force) exerted on the carrier pipe shall be measured continuously and limited to the maximum allowed by the pipe manufacturer to prevent the pipe and/or joints from becoming overstressed. Vertical and horizontal curves shall be limited so that wall stresses do not exceed 50% of yield stress for flexural bending of the carrier pipe. If the pipe is buckled or otherwise damaged, the damaged section shall be removed and replaced by the CONTRACTOR at his expense.

12. After the carrier pipe is completely pulled through the bore hole, a sufficient relaxation period as recommended by the specified pipe manufacturer shall be provided prior to the final pipe tie-in.

D. Handling Drilling Fluids And Cuttings

1. During the drilling, reaming, or pullback operations, the CONTRACTOR shall make adequate

provisions for handling the drilling fluids, or cuttings at the entry and exit pits.

2. To the extent practical, the CONTRACTOR shall maintain a closed loop drilling fluid system.
3. Any drilling fluid that enters the pipe shall be removed by flushing or other suitable methods.

4. The CONTRACTOR shall conduct his directional drilling operation in such a manner that drilling fluids do not compromise nearby structures or are introduced into nearby waterways. Spent drilling fluids and cuttings shall be confined to the entrance and exit pits.

5. When the Contractor's provisions for storage of the fluids or cuttings on site are exceeded, these materials shall be hauled away to a suitable legal disposal site. During the entire operation, waste and leftover drilling fluids from the pits and cuttings shall be dewatered and disposed of in accordance with all permits and regulatory agencies requirements by the CONTRACTOR.

6. The disposal of the drilling fluids and any necessary flushing of the pipe shall be incidental to the work.

3.06 UNSUCCESSFUL DRILLING/PULL-BACK

A. Indavetant Returns (Frac-Outs)

1. All care shall be taken to prevent the loss of drilling fluids into the ground or the environment.

2. Precautionary measures shall be undertaken to minimize the impact of any inadvertent spillage of fluids on return or at exit of the HDD. The CONTRACTOR shall supply at all times a full and complete spillage kit including vacuum truck for the dealing of frac-outs or spillages.

3. If, at anytime during the drilling, reaming or pull-back processes a loss of drilling fluid occurs, the drilling process will be stopped

immediately and the cause of the sudden loss investigated. Drilling will only recommence once the cause has been identified, contained, remediated and a procedure put in place to prevent it from reoccurring.

4. Returned fluids shall be properly contained, reclaimed and recirculated. It shall be the contractor's responsibility to manage, contain and dispose of all drilling fluids and cuttings. costs related to inadvertent returns.

5. The CONTRACTOR shall be responsible for costs related to the containment, remediation and disposal of any inadvertent returns as well as the incidental and direct costs of liabilities associated with of frac-outs including but not limited to fines or fees assessed to the OWNER as a result of the CONTRACTOR's activities or inactivity.

B. Heaving And Bore Cavities

1. Drilling fluid to be used to facilitate the installation of the pipe shall be adjusted within acceptable limits such that ground heaving and subsurface cavity formation through erosion are prevented.

2. A variation greater than ± 18 inches from the horizontal and ± 0.5 percentage points from the designated grade may be sufficient reason for the rejection of the pipe, and the pipe shall be re-bored to proper grade if so directed by the ENGINEER at no cost to the OWNER.

C. Bore Failure

1. Any failures in bores shall be fully sealed and fully grouted with suitable material by the CONTRACTOR to prevent damage to the surrounding environment, existing assets, structures and pavements. Grout used shall be approved by the ENGINEER prior to use.

2. Any bits, drills, reamers, or other tools lost or stuck in the hole shall be removed at the

Contractor's expense. If tools cannot readily be removed, CONTRACTOR may at the CONTRACTOR's option abandon the hole. The CONTRACTOR will seal the borehole and re-drill the crossing. No payment shall be made for any lost equipment, material, or work on abandoned holes.

3.07 TESTING

A. The CONTRACTOR shall be responsible for transporting and storing any and all testing materials including water required for hydrostatic testing.

B. Pipe Testing

1. Testing of the product pipe shall be performed at various stages during the pipe construction, and following a successful pull-back of the pipe. All testing shall be performed and determine acceptable pursuant to the terms of Section 02620 of these Specifications.

2. The CONTRACTOR shall provide a record of testing carried out and results at each stage to the OWNERs Representative.

3. Following successful pullback of pipe, it shall be hydrostatically pressure tested by a certified tester in accordance with the requirements of Section 02620 of these Specifications.

4. If the hydrostatic test fails, the line shall be repaired or reinstalled and then retested.

5. The CONTRACTOR shall be responsible and liable for all failure of installed pipe, and shall remedy, repair and rectify the pipe.

6. After successful completion of hydro-test, pipe will pigged dry.

3.08 CLEANING AND SIZING PIGS

A. After the pipe is in place and tested, cleaning pigs shall be used to remove residual water and debris.

B. After the cleaning operation, the CONTRACTOR shall provide and run a sizing pig to check for anomalies in the form or buckles, dents, excessive out-of-roundness, and any other deformations. The sizing pig run shall be considered acceptable if the survey results indicate that there are no sharp anomalies (e.g. dents, buckles, gouges, and internal obstructions) greater than 2-percent of the nominal pipe diameter, or excessive ovality greater than 5-percent of the nominal pipe diameter. For gauging purposes, dent locations are those defined above which occur within a span of five feet or less. Pipe ovality shall be measured as the percent difference between the maximum and minimum pipe diameters. For gauging purposes, ovality locations are those defined above which exceed a span of five feet.

End of Section

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SECTION 02298

BORING

PART 1: GENERAL

1.01 RELATED WORK

A. Shoring: Section 02150

B. Excavating, Backfilling and Compacting: Section 02220

C. Piped Wastewater Sewers Section 02730

D. Division 3 - Concrete

1.02 QUALITY ASSURANCE

A. Workman Qualifications:

1. Use only personnel thoroughly trained and experienced in the skills required.

2. Welds shall be made only by welders, tackers and welding operators who have been previously qualified by tests as prescribed in the Structural Welding Code AWS D1.1 of the American Welding Society to perform the type of work required.

B. Design Criteria:

1. Encasing conduit under railroad tracks shall be of sufficient strength to support all superimposed loads, including a Cooper E 80 Loading with 50 percent added for impact.

C. Requirements of Regulatory Agencies:

1. Materials and methods of construction used on railroad company property shall be subject to the approval of the railroad company and the Contractor shall at all times conduct his work and operations fully within the railroad company's rules, regulations and requirements. Ascertain from the railroad company, its rules, regulations and requirements, and what, if any delays may be

encountered. If required by the railroad company, submit for approval an outline of the methods and means proposed for prosecuting the work.

2. Perform work within the railroad company's property in accordance with the requirements of the current edition of Railroad Company Specifications, the American Railway Engineering Association specifications, and any governing laws or regulations.

3. Record and have on file details pertaining to railroad company inspections. Include as a minimum the dates of inspections, number of railroad company personnel and number of hours spent on inspections, number of railroad company personnel and number of hours spent on inspection by railroad company personnel. Identify contractor personnel also present.

4. Furnish and erect crossing signs on both sides of the tracks. The actual location where each sign is to be erected will be established by the Engineer in the field.

5. Materials and methods of construction used on state highways shall be subject to the approval of the Pennsylvania Department of Transportation and the Contractor shall at all times conduct his work and operations fully within the Pennsylvania Department of Transportation, regulations and requirements. Ascertain from the OWNER, a copy of the permit identifying requirements of the construction.

6. Perform work within the state highway in accordance with the requirements of the Pennsylvania Department of Transportation Publication 408 latest edition.

7. Record and have on file details pertaining to inspections by the Pennsylvania Department of Transportation. Include as a minimum all personnel from the state, contractor and others present and number of hours spent on inspection by the state.

1.03 REFERENCES

A. American Association of State Highway and Transpiration Officials (H-20): (AASHTO) Loading for Conduits Installed Under Streets, Roads, or Highways.

B. American Railway Engineering Association (A.R.E.A.) (Cooper E-80).

C. American Society for Testing and Materials:

1. ASTM A 53, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless, 35,000 PSI minimum yield strength.
2. ASTM C 32, Specification for Sewer and Manhole Brick (Made from Clay or Shale).
3. ASTM C 33, Specification for Concrete Aggregates
4. ASTM C 150, Specification for Portland Cement.
5. ASTM C 270, Specification for Mortar for Unit Masonry.

D. American Welding Society: AWS D1.1 Structural Welding Code.

E. Pennsylvania Department of Transportation Publication 408 Latest Edition.

F. CE-8 Specification for Pipeline Occupancy of CSX Transportation, Inc. property.

G. Requirements and Specifications for Pipeline Occupancy, National Railroad Passenger Corporation, Northeast Corridor (Control No. OCE-0110).

1.04 SUBMITTALS

A. Shop Drawings and Product Data: Furnish completely dimensioned shop drawings, cuts or other data as required to provide a complete description of Products to be installed.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Transport, handle and store materials and Products specified herein in a manner recommended by the respective manufacturers of such to prevent damage and defects.

1.06 SITE CONDITIONS

A. Classification of Materials:

1. Boring: No consideration will be given to the nature of materials encountered in boring for Pipe Line Crossings. Remove rock encountered during the

boring operation, no separate or additional payment will be made for boring through rock.

B. Scheduling:

1. The CONTRACTOR shall schedule work with the Pennsylvania Department of Transportation, Railroad Company, or other property owner and coordinate same with the Owner's Representative.

C. Environmental Requirements:

1. As specified in here in the Contract Documents.

D. Protection: As specified in Section 02220 and such added requirements included herein.

1. Adequately support and protect utilities and facilities that are encountered in, or may be affected by, the work.

2. Temporary track support to be provided shall be as shown on CSX Transportation Company's Drawing Number 43380-R1 entitled "Temporary Track Support for Support of Tracks When Tunneling or Driving Pipe" which is included hereinafter at the end of this Section of the Specifications.

3. Shoring: As specified in Section 02150.

4. Accommodation of Traffic: As specified in Section 01550.

5. Barriers and enclosures as specified in Section 01551.

6. Explosives and Blasting: Not permitted in performance of work of this Section.

7. Excavation Conditions: As specified in Section 02220.

8. Excess Materials: As specified in Section 02220.

PART 2: PRODUCTS

2.01 ENCASING CONDUIT

A. Steel Pipe: ASTM A53, Grade B.

1. Minimum Diameter: As shown on the Drawings.

2.02 CARRIER PIPE AND FITTINGS

A. Carrier Pipe shall be as specified herein and or as noted on the contract drawings.

2.03 MISCELLANEOUS MATERIAL

A. Concrete: As specified in Cast-In-Place: Section 03300.
   1. Class B: 3000 psi

B. Lean Concrete: 2000 psi compressive strength at 28 days with minimum cement content per cubic yard in accordance with current ready-mix plant standard practice.

   1. Reduced Aggregate: Aggregate with particle size not less than 1/8-inch or more than ½-inch in any dimension and a maximum of 5 percent of particles passing a #8 sieve.

C. Aggregate Backfill:

   1. AASHTO No. 8 Coarse Aggregate conforming to Pennsylvania Department of Transportation Section 703.2

   2. Select Granular Material (2RC) conforming to Pennsylvania Department of Transportation Section 703.3.

D. Brick: Commercially manufactured brick made from clay or shale and burned, meeting requirements of ASTM C32, Grade MS.

E. Grout (Sand/Cement):

   1. Portland Cement: ASTM C 150 Type II.
   2. Sand: ASTM C 33, fine aggregate.
   3. Water: Portable.
   4. Grout Quality: Mixture of one part Portland cement, three parts fine aggregate and water.

F. Treated Wood Blocking (Pipe Support on Conduit): Wood species of the allowable types under the WWPA or SPIB grading rules and stamped to indicate product compliance with U.S. Dept. of Commerce Product Standard PS-20-70.

   1. Preservative treatment shall conform to American Wood Preserves Association Standard P-5 (0.60

pounds per cu. Ft. of wood) for soil contact service; Wolman CCA Type C, or equal.

2. Steel Bands: Use one inch wide (min.) stainless steel strapping to make the treated wood blocking attachment bands. Secure the bands in place with stainless steel compression style band clamps. Provide a minimum of two bands on each set of treated wood blocking.

G. Casing Spacers (Pipe support in conduit): Casing spacers shall be 14 gauge steel with 90 mil PVC or Neoprene liner having a width of 12 inches. Spacers shall be installed as recommended by the manufacturer to provide proper support of the carrier pipe. Spacers shall have abrasion resistant dielectric runners and dielectric inner liner. Casing pipe shall have rubber end seals matching the diameter of the casing pipe and carrier pipe and shall be held in place with stainless steel bands. Spacers shall be as manufactured by Advance Products or an approved equal.

H. Railroad Crossing Sign:

1. Dimensions and letterings as shown on the Drawings.

2. Sign Plate: Mill finish aluminum allow 6061-T6, minimum 0.080 inch thick.

3. Steel Pipe Post: Shall conform to ATM A 120 with schedule 40 wall thickness ad galvanized finish.

4. Aluminum U-bolts, Nuts and Washers: ASTM F 467 and ASTM F 468.

5. Painting:

a. Thoroughly clean sign plate surfaces with mineral spirits to remove grease, dirt and moisture.

b. Apply one coat of Sherwin Williams Zinc Chromate Primer #B50Y1, which when thoroughly dry shall be followed by 2 coats of Sherwin Williams Metalastic Enamel (White).

c. When the second coat of enamel has thoroughly dried, perform the required lettering to the satisfaction of the Engineer using the services of a professional sign painter and an

approved grade of exterior black paint or enamel.

PART 3: EXECUTION

3.01 INSPECTION

A. Inspect materials and Products before installing in conformance with the inspection requirements of the appropriate referenced standard.

B. Remove rejected materials and products from the project.

3.02 PREPARATION

A. Excavation: As specified in Section 02220 and such added requirements included herein:

1. Should the Contractor in constructing any (boring) (or jacking) pit excavate below the subgrade from the carrier pipe, he shall be required to backfill the area excavated below the subgrade with Aggregate Backfill or with Concrete, as required by the Engineer, at no increase in Contract Price.

3.03 PERFORMANCE

A. All Pipelines where identified in the Contract Drawings shall be bored or augured in place at the elevations and along the alignments shown on the plans and profiles. The CONTRACTOR shall be responsible for construction to true line and grade and shall be held fully responsible for protecting against surface subsidence, damages or disturbances to adjacent property and facilities from his construction operations and shall rectify resultant subsidence, damages or disturbances to the satisfaction of the ENGINEER.

B. The CONTRACTOR shall be required to submit complete details and descriptions of the proposed operations, indicating all construction characteristics of the boring as well as details of all portals and other open excavations in the vicinity. Before actual construction work commences written approval of the Pennsylvania Department of Transportation and or railroad shall be compulsory. Details submitted to the Department and or railroad by the CONTRACTOR shall include but will not necessarily be limited to the following: details of method proposed, approximate time of commencement, complete sheeting and bracing details, number of shifts

and hours per shifts and hours per shift anticipated for the work, equipment proposed to be used, provisions and details of barricades and night lights and all other pertinent or additional information required by the respective agency.

C. All sheeting, shoring, bracing, lining, etc., required for the construction of shafts, portals, etc. shall be furnished and installed by the CONTRACTOR and shall conform to the requirements set forth under "Open Excavation". All work relative to the installation of water mains, sewers and force mains by the boring method shall be performed in accordance with the regulations set forth under Subpart S, "Tunnels and Shafts, Caissons, Cofferdams and Compressed Air" published as part of the Safety and Health Regulations for Construction by the U.S. Department of Labor.

D. Where possible, boring operations shall be conducted from the high end of the pipe. When augers, or similar devices, are used for encasing conduit emplacement, the front of the encasing conduit shall be provided with mechanical arrangements or devices that will positively prevent the auger and cutting head from leading the encasing conduit. The method of augering the entire hole and then pushing the encasing conduit through will not be permitted. At certain pipe line locations slope of the encasing conduit, its gradient and therefore, elevations, are extremely critical and, each CONTRACTOR shall program his boring activities so that the pipeline connections/gradient will be accomplished as shown on the drawings. All CONTRACTOR's shall coordinate their activities and cooperate with each other to assure construction at the correct alignments and gradients. They shall also minimize field conflicts where working areas are confined and where scheduling becomes a problem.

E. The CONTRACTOR shall check the conduit alignment and grade at least once during each shift as work continues.

F. Wherever pipe lines are shown and specified to be bored in place, said pipes shall be encased in the specified diameter steel casing pipes as shown on the contract drawing. The contractor shall have the option to install a larger diameter encasing conduit than shown in the drawing upon approval by the owner's representative and there shall be not extra payment. If the CONTRACTOR elects to install a larger diameter encasing conduit under the roadway, and or railroad tracks, he shall

maintain required clearances under said roadway and or railroad track along with the specified pipeline gradient.

G. CONTRACTOR shall install the pipeline in the conduit as specified herein. Support and maintain the alignment and grade of the pipeline using the specified wood blocking in accordance with detail SD 2-006 or specified casing spacers in accordance with standard detail SD-2-005.

H. Cleanup: As specified in the Contract Documents

3.04 FIELD QUALITY CONTROL

A. Testing: After laying pipe line in encasing conduit and before filling conduit line acceptance testing as specified in accordance with the requirements of the carrier pipe line.

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SECTION 02500

PAVING AND SURFACING

PART 1: GENERAL

1.01 WORK INCLUDED

A. CONTRACTOR shall furnish all equipment, plant, labor, and materials required for the construction of paving and surfacing required of the Contract and shall include furnishing and installing all materials required to complete the project as described in the Plans and Specifications.

B. The CONTRACTOR and his surety will continue to be liable for all latent defects. However, the surety is liable only until the performance/maintenance bond is released. The ENGINEER will determine when a defect is a latent defect. The CONTRACTOR shall satisfactorily repair or correct latent defects, at no expense to the OWNER. If the defects cannot be satisfactorily repaired or corrected, provide reimbursement for any expenses or damages incurred by the OWNER because of the defects.

C. The CONTRACTOR shall remove, renew, restore, and repair damage to any part of the work, occurring before acceptance, which is due to the action of the elements or any other cause. Repair such work, in accordance with the terms and conditions of the contract, at no expense to the OWNER except if the damage is due to unforeseeable causes beyond the control of the CONTRACTOR, as determined by the ENGINEER.

D. The CONTRACTOR shall furnish all plant, labor, equipment, barricades, warning and protective devices to protect the new construction and paving within the limits of work at all times. CONTRACTOR shall submit time schedule for work to be performed.

E. The CONTRACTOR shall furnish all plant, labor, tools equipment, barricades, warning and protective devices required to protect the paving courses by erecting and maintaining said barricades to prevent vehicular, pedestrian, and bicycle traffic from the new surface courses after placement of materials to permit adequate stability and adhesion of the aggregate.

F. All distribution and trucks used under this contract shall be properly cleaned and shall meet the requirements

of and be equipped as specified by the Pennsylvania Department of Transportation and shall be calibrated by a recognized engineering firm. A certified calibration chart shall accompany the distributor at all times. All distributors shall be equipped with a tachometer or an approved metering device and asphalt sampling containers for test samples.

G. Mixing Plant, hauling equipment, pavers and rollers shall be suitable to complete all required work in accordance with the requirements of Pennsylvania Department of Transportation Section 400 of Publication 408, 2007 edition as amended.

H. CONTRACTOR shall provide all hauling equipment required or necessary to move pavers, rollers or chipping equipment from street to street as a part of those items specified in the form of proposal.

PART 2: PRODUCTS

2.01 BITUMINOUS ASPHALT PAVING

A. All materials furnished, supplied, delivered or used under this contract shall be in accordance with the PennDOT Publication 408, 2007 edition as amended, or as specified herein and the CONTRACTOR will be required to certify that the material used under these contracts shall meet these specifications.

B. Coarse aggregate will be slag, gravel or stone manufactured from approved sources as listed in Bulletin No. 14 (Publication No. 34), "Aggregate Products" current edition.

C. Fine aggregate for bituminous mixtures will be manufactured from approved sources as listed in Bulletin No. 14 (Publication No. 34), "Aggregate Producers" current edition.

D. Bituminous material shall be manufactured from approved sources and meet the requirements of Bulletin No. 25 (Publication No. 37),"Specifications for Bituminous Materials" current edition.

E. Bituminous concrete mixtures shall be manufactured as approved and specified in Bulletin No. 27 (Publication No. 27), "Design Procedures/Specifications, Special Bituminous Mixtures" current edition and be from approved sources as listed in Bulletin No. 41 (Publication No. 41), "Producers of Bituminous Mixtures" current edition.

F. All equipment used in mixing, hauling, spreading, rolling, chipping, applying liquid asphalt and tools necessary to perform and complete all work herein specified shall be in accordance with the requirements of PennDOT Publication 408 dated 2007 as amended.

G. All material furnished, delivered or applied shall comply with the requirements of Section 106 "Control of Material" of Publication 408 dated 2007 as amended.

H. Materials required to meet PennDOT specifications shall be tested in accordance with the requirements of Publication 408 2007 edition as amended.

I. Brooming and Cleaning and Bituminous Tack Coat

1. Brooming and cleaning shall be performed in locations requiring subsequent leveling, binder, or wearing courses.

2. Brooming and cleaning shall be as specified in Publication 408, Section 400 "Flexible Pavements". All unsuitable material shall be disposed of by the CONTRACTOR at a site secured by the CONTRACTOR.

3. The bituminous tack coat shall be furnished and applied to existing wearing surfaces in locations requiring subsequent leveling, binder, or wearing courses.

4. The bituminous tack coat shall be applied with an approved distributor as specified in Publication 408, Section 460 "Bituminous Tack Coat".

5. The tack coat shall be Class AE-T Emulsified Asphalt. CONTRACTOR shall submit a certified affidavit that material complies with PennDOT Publication 408, Section 460.

6. The bituminous tack coat shall be applied at the rate of 0.07 to 0.10 gallons per square yard on all surfaces of the existing bituminous pavement to be resurfaced.

J. Superpave Binder

1. The Superpave Binder material shall be furnished and placed in locations as specified herein and by the ENGINEER/OWNER's Representative.

2. Keyways shall be cut at limits of work.

3. CONTRACTOR shall furnish Superpave Binder Course, place and roll Binder course as specified and meeting the requirements of Publication 408.

4. Bituminous material shall meet the requirements of Publication 408, Section 401.2.

5. Areas to be covered with Bituminous Binder Course material will be as shown on the drawings.

K. Superpave Wearing Course

1. Superpave Wearing Course shall be furnished and placed as specified herein and by the ENGINEER/Owner's Representative.

2. CONTRACTOR shall furnish and place, and roll the required compacted depth Superpave Wearing Course material on the prepared driveways/roads surface as specified and meeting the requirements of Publication 408.

3. Bituminous material shall meet the requirements of Publication 408, Section 401.2.

4. The coarse aggregate used in the preparation of the surface course shall be Type "A" in accordance with Publication 408, section 703.2, Table B. Provide combined gradation with fine aggregate in accordance with Publication 408 Section 703.1(c) 1, Table A.

L. Joint

1. Longitudinal and traverse joints shall be in accordance with Pennsylvania Department of Transportation Publication 408, Section 400 Flexible Pavements. All new pavement edges to be treated with Class E-1, E-6, or E-8 emulsified asphalt. Prior to sealing, clean and free harmful material from area to be sealed. Control the application rate so residual asphalt completely fills surface voids provides a water tight joint.

PART 3: EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

A. Where construction activities damage or disturb cartway, berms and/or shoulders along State, Municipal, and Private Roads and bike trails, the work shall be conducted and the cartway and berms shall be restored in a manner as is described herein. Attention is directed to the fact, however, that all backfill between the top elevation of the pipe zone and the surface of the road and/or berm along those State Roadways shall be well compacted 2RC material in accordance with the requirement of the PA Department of Transportation regardless of the distance between the edge of paving and the side of ditch. All backfill between the top elevation of the pipe zone and the surface of Private Roads, Municipal Roads and/or berms shall be well compacted 2A material or other aggregate as required by the Municipal Street Owner. Where open trenches cross Municipal Streets or Roads, 2A material backfill or aggregate as required by the Municipal Street Owner backfill shall be placed for the full trench width, for the full depth of backfill on both sides of the edge of paving, in addition to being placed under the pavement.

B. At locations where construction is on private properties and adjacent to PennDOT right of ways, stockpiling of excavated material within the above rights of ways is prohibited.

C. All paving removed, damaged or destroyed during the construction of this work shall be replaced by one of the following methods equal to or greater then that existing before construction. Where damage is within two feet of the curb or edge of roadway, replacement shall be to that curb or paving edge. The CONTRACTOR shall guarantee all paving replaced against defect and settlement for a period of eighteen months after the date of the final estimate.

D. All paving and/or berm areas disturbed or damaged along State Roadways as a result of pipeline construction or by other activities of the CONTRACTOR shall be replaced in a manner equal to or greater then the quality of the existing surfaces and, to the satisfaction of the OWNER and PADOT. The paving and berm restoration shall conform strictly to the standards of the Pennsylvania Department of Transportation Publication 408.

E. The CONTRACTOR is cautioned that damage caused by tracked equipment on any finished road, street, driveway, sidewalk, etc. surface inside or outside of the work area will be restored by the CONTRACTOR at his cost.

F. Prior to placing of any new bituminous material, all exposed vertical joints must be cleaned and primed with AC-20 Asphalt Cement or with Emulsions E1, E6 or E8.

G. All bituminous material shall be installed and compacted by methods and with equipment approved by the Pennsylvania Department of Transportation.

H. When all paving and compaction is completed all joints shall be sealed using AC-20 Asphalt Cement or with Emulsions E1, E6 or E8. This application shall be a minimum of six inches in width. All bituminous material shall be installed and compacted by methods and with equipment approved by the Pennsylvania Department of Transportation.

I. The CONTRACTOR shall protect newly paved areas keeping traffic off of the area until adequate curing and stability is attained and as directed by the ENGINEER.

J. All painted traffic lines and markings destroyed during the construction of this project shall be replaced. All painted traffic lines and markings shall be installed according to the Commonwealth of Pennsylvania Department of Transportation Publication 408, Section 962, and all other applicable sections.

3.02 NON-RIGID PAVING

A. There are areas along private property and/or bike trails where the proposed pipeline will be adjacent to or encroach upon or where bore pits may be located in or adjacent to an improved area. In those areas where an improved area is damaged as a result of sanitary sewer construction the trench area shall be backfilled full depth with select material (2RC) compacted in lifts as described previously in these technical specifications. The improved surface shall be restored to a condition equal to or greater then that existing prior to construction.

3.03 PRIVATE DRIVEWAYS

A. All non-rigid bituminous surface paving shall be restored by neatly and uniformly cutting the edges 12 inches beyond the trench edge each side and placing a binder course and wearing course over the trench fill in accordance with requirements of the Pennsylvania Department of Transportation Publication 408. The base course shall be compacted 4 inch superpave binder course, followed by Superpave Wearing Course totaling 1-1/2" after compaction. Seal edges with hot bituminous liquid. The trench shall be backfilled full depth with select material 2A Limestone compacted in lifts.

3.04 CONCRETE DRIVEWAYS:

A. All concrete paving shall be restored by neatly and uniformly cutting the edges and placing a 6" thick reinforced concrete slab over the trench. The concrete shall be reinforced with 6x6x10 gauge wire mesh. If the proposed sewer line trench is within 3 feet of an existing joint in the concrete driveway the existing pavement shall be saw cut at the joint and replaced to that existing joint. If the proposed trench is not within 3 feet of an existing joint in the concrete driveway the CONTRACTOR shall saw cut to the limits of the trench and replace the concrete as described above placing a new joint on one side of the new concrete paving where it matches the existing concrete.

3.05 STONE/SLAG/GRAVEL DRIVES:

A. Where the proposed construction crosses existing stone, slag or gravel driveways the driveway shall be restored by placing a 4" thick lift of crushed limestone for the full length and width of the disturbed area. The limestone shall consist of hard, tough, durable stone free from slatey texture or cleavage planes. The limestone shall be secured from a PADOT approved supplier. Sandstone, shale, slag etc., will not be an acceptable substitute.

End of Section

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SECTION 02609

DETECTABEL MARKING TAPE

PART 1: GENERAL

1.01 The CONTRACTOR shall furnish and install magnetical detectable tape. Marking tape shall be detectable with conventional location equipment and therefore shall be encased in aluminum foil or other similar material.

1.02 The marking tape shall be minimum three (3) inch width and shall be installed two (2) feet above the pipe and along the pipe line installed.

1.03 At locations where existing utilities are exposed during construction, the CONTRACTOR shall also install the appropriate marking tape identifying that utility at the pipe line crossing.

1.04 Marking tape shall be vividly colored in accordance with standard industry color standards. Tape shall be marked "Gravity Sewer Line" at gravity sewers, "Intermittent Pressure Sewer" at force Mains and "Waterline" at water lines, storm sewer, gas, or electric above those buried lines.

PART 2: PRODUCTS

2.01 Marking tape shall be as manufactured by the Terra Tape or an approved equal.

PART 3: EXECUTION

A. Not used.

End of Section

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SECTION 02620

HDPE PIPE FOR SANITARY SEWER FORCE MAINS

PART 1: GENERAL

1.01 SCOPE

A. This specification covers requirements for high-density polyethylene piping for sanitary sewer force mains. All work shall be performed in accordance with these specifications.

B. Sanitary sewer force main construction shall be performed in accordance with engineered construction plans for the work.

C. Unless otherwise noted HPDE pipe shall conform to the industry ratings for a dimension ratio (DR) of 9.

1.02 REFERENCED STANDARDS

A. Where all or part of a Federal, ASTM, ANSI, AWWA, etc., standard specification is incorporated by reference in these Specifications, the reference standard shall be the latest edition and revision.

1.03 QUALITY ASSURANCE

A. Design Criteria:

1. Use one type and class of pipe in continuous line of sewer between structures, unless otherwise indicated on the Drawings.

2. Use pipe and fittings designed to withstand imposed trench loadings and conditions at the various locations.

1.04 SUBMITTALS

A. Shop Drawings and Product Data: Submit completely dimensioned shop drawings, catalog cuts and such other data as required to provide complete descriptive information for the following:

1. Sewer Pipe and Fittings

2. Piping Specialties
3. Service Connection Pipe and Fittings

B. Certificates:

1. Certified records or reports of results of shop tests, such records or reports to contain a sworn statement that shop test have been performed as specified.

2. Manufacturer's sworn certification that pipe will be manufactured in accordance with specified reference standards for each pipe type.

1.05 QUALIFICATION OF MANUFACTURERS

A. The Manufacturer shall have manufacturing and quality assurance facilities capable of producing and assuring the quality of the pipe and fittings required by these Specifications. The Manufacturer's production facilities shall be open for inspection by the Owner or his Authorized.

B. Compliance Tests. Manufacturer's inspection and testing of the materials. In case of conflict with Manufacturer's certifications, the Contractor, Project Engineer, or Owner may request retesting by the Manufacturer or have retests performed by an outside testing service. All retesting shall be at the requestor's expense, and shall be performed in accordance with the Specifications.

1.06 APPROVED MANUFACTURERS

A. Performance Pipe, a division of Chevron Phillips Chemical Company, LP or equivalent.

PART 2: PRODUCTS

2.01 POLYETHYLENE PIPE AND FITTINGS Materials

A. Materials used for the manufacture of polyethylene pipe and fittings shall be PE 3608 (formerly PE 3408) high density polyethylene meeting cell classification 345464C for black or 345464E for stripes per ASTM D 3350; and shall be Listed in the name of the pipe and fitting Manufacturer in PPI (Plastics Pipe Institute)

TR-4, *Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fittings Compounds*, with a standard grade HDB rating of 1600 psi at 73°F. The Manufacturer shall certify that the materials used to manufacture pipe and fittings meet these requirements.

B. Interchangeability of Pipe and Fittings. The same Qualified and Approved Manufacturer shall supply polyethylene pipe and fittings. Products from non-approved Manufacturers are prohibited. Pipe and fittings from different Manufacturers may be used if both are approved.

2.02 POLYETHYLENE PIPE

A. Polyethylene pipe shall be manufactured in accordance with AWWA C901-02 for sizes 1-1/4" thru 3" IPS diameters and to the requirements of ASTM D3035. Pipe 4" and above DIPS sized shall be manufactured to the requirements of ASTM F714 and AWWA C906-07.

B. Service Identification Stripes. Permanent identification of the piping service shall be provided by co-extruding color stripes into the pipe outside surface. The striping material shall be the same material as the pipe material except for color. Stripes printed on the pipe outside surface shall not be acceptable. IPS sized pipes shall have four equally spaced, longitudinal color stripes. DIPS sized pipes shall have three equally spaced pairs of longitudinal color stripes. The stripe color shall be green.

C. Polyethylene Fittings & Custom Fabrications. Molded polyethylene fittings shall be supplied by Performance Pipe. Fabricated fittings shall be supplied by an approved Manufacturer. All fittings and custom fabrications shall be pressure rated for the same internal pressure rating as the mating pipe.

D. Molded Fittings. Molded fittings shall be manufactured and tested in accordance with ASTM D 3261 and shall be so marked.

E. X-Ray Inspection. The Manufacturer shall submit samples from each molded fittings production lot to x-ray inspection.

2.03 FABRICATED FITTINGS

A. Fabricated fittings shall be made by heat fusion joining specially machined shapes cut from pipe, polyethylene sheet stock, or molded fittings. Fabricated fittings shall be rated for internal pressure service at least equal to the full service pressure rating of the mating pipe.

B. Polyethylene Flange Adapters. Flange adapters shall be made with sufficient through-bore length to be clamped in a butt fusion-joining machine without the use of a stub-end holder. The sealing surface of the flange adapter shall be machined with a series of small v-shaped grooves (serrations) to promote gasketless sealing, or restrain the gasket against blowout.

C. Back-up Rings & Flange Bolts. Flange adapters shall be fitted with back-up rings pressure rated equal to or greater than the mating pipe. The back-up ring bore shall be chamfered or radiused to provide clearance to the flange adapter radius. Flange bolts and nuts shall be Grade 2 or higher.

D. MJ Adapters. MJ Adapters 4" thru 16" may be provided with optional Stainless Steel Stiffener upon request. MJ Adapters 14" and above shall be provided with Heavy Duty Backup Ring Kits. All MJ adapters above 18" must be provided with Stainless Steel stiffeners.

PART 3: EXECUTION

3.01 JOINING

A. Heat Fusion Joining

1. Joints between plain end pipes and fittings shall be made by butt fusion. Joints between the main and saddle branch fittings shall be made using saddle fusion. The butt fusion and saddle fusion procedures used shall be procedures that are in accordance with ASTM F2620. The Contractor shall ensure that persons making heat fusion joints have received training in the recommended procedure. The Contractor shall maintain records of trained personnel, and shall certify that

training was received not more than 12 months before commencing construction. External and internal beads shall not be removed.

2. Butt Fusion of Unlike Wall Thickness. Butt fusion shall be performed between pipe ends, or pipe ends and fitting outlets that have the same outside diameter and are not different in wall thickness by more than one Standard DR, for example, SDR 13.5 to SDR 17, or SDR 11 to SDR 13.5. Transitions between unlike wall thickness greater than one SDR shall be made with a transition nipple (a short length of the heavier wall pipe with one end machined to the lighter wall) or by mechanical means or electrofusion. SDR's for polyethylene pipe are 7.3, 9, 11, 13.5, 17, 21, 26, 32.5 and 41.

3. Heat Fusion Training Assistance. Upon request and at the requestor's expense, training personnel from the Distributor shall be made available.

B. Joining by Other Means

1. Polyethylene pipe and fittings may be joined together or to other materials by means of (a) flanged connections (flange adapters and back-up rings), (b) mechanical couplings designed for joining polyethylene pipe or for joining polyethylene pipe to another material, (c) MJ Adapters or (d) electrofusion. When joining by other means, the installation instructions of the joining device manufacturer shall be observed.

2. ID Stiffener and Restraint. A stiffener shall be installed in the bore of the polyethylene pipe when an OD compression mechanical coupling is used and when connecting plain end PE pipe to a mechanical joint pipe, fitting or appurtenance. External clamp and tie rod restraint shall be installed where PE pipe is connected to the socket of a mechanical joint pipe, fitting or appurtenance except where an MJ Adapter is used.

3. Branch Connections. Branch connections to the main shall be made with saddle fittings or tees.

Polyethylene saddle fittings shall be saddle fused to the main pipe per 3.01.

3.02 INSTALLATION

A. General

1. When delivered, a receiving inspection shall be performed and any shipping damage shall be reported to the Manufacturer within 7 days. Installation shall be in accordance with ASTM D 2774, Manufacturer's recommendations and this specification. All necessary precautions shall be taken to ensure a safe working environment in accordance with all applicable safety codes and standards.

B. Large Diameter Fabricated Fittings

1. One plain-end connection of 16" DIPS and larger fabricated directional fittings (elbows, tees, etc.) shall be butt fused to the end of a pipe length. The remaining fitting connections shall be made in the trench using butt fusion, flange or other connection means in accordance with 3.01. Flange and other mechanical connections shall be assembled, and tightened in accordance with the connection manufacturer's instructions and 3.02C. Handling, lifting, moving or lowering a 16" DIPS or larger fabricated fitting that is connected to more than one pipe length is prohibited. The installing contractor at his expense shall correct fitting damage caused by such improper handling.

C. Mechanical Joint & Flange Installation. Mechanical joint and flange connections shall be installed in accordance with the Manufacturer's recommended procedure. MJ Adapters and flanges shall be centered and aligned to the mating component before assembling and tightening bolts. In no case shall MJ gland or flange bolts be used to draw the connection into alignment. Bolt threads shall be lubricated, and flat washers should be used under the nuts. Bolts shall be evenly tightened according to the tightening pattern and torque step recommendations of the Manufacturer. At least 1 hour after initial assembly, flange

connections shall be re-tightened following the tightening pattern and torque step recommendations of the Manufacturer. The final tightening torque shall be as recommended by the Manufacturer.

3.03 PIPE HANDLING

A. When lifting with slings, only wide fabric choker slings capable of safely carrying the load shall be used to lift, move, or lower pipe and fittings. Wire rope and chain are prohibited. Slings shall be of sufficient capacity for the load, and shall be inspected before use. Worn or damaged equipment shall not be used.

3.04 BACKFILLING

A. Embedment material soil type and particle size shall be in accordance with ASTM D 2774. Embedment shall be placed and compacted to at least 90% Standard Proctor Density in 6" lifts to at least 6" above the pipe crown. During embedment placement and compaction, care shall be taken to ensure that the haunch areas below the pipe springline are completely filled and free of voids.

B. Protection against shear and bending loads. In accordance with ASTM D 2774, connections shall be protected where an underground polyethylene branch or service pipe is joined to a branch fitting such as a service saddle, branch saddle or tapping tee on a main pipe, and where pipes enter or exit casings or walls. The area surrounding the connection shall be embedded in properly placed, compacted backfill, preferably in combination with a protective sleeve or other mechanical structural support to protect the polyethylene pipe against shear and bending loads.

3.05 TESTING

A. Fusion Quality

1. The Contractor shall ensure the field set-up and operation of the fusion equipment, and the fusion procedure used by the Contractor's fusion operator while on site.

2. Upon request by the Owner, the Contractor shall verify field fusion quality by making and testing a trial fusion. The trial fusion shall be allowed to cool completely; then test straps shall be cut out and bent strap tested in accordance with ASTM F2620.

3. If the bent strap test of the trial fusion fails at the joint, the field fusions represented by the trial fusion shall be rejected. The Contractor at his expense shall make all necessary corrections to equipment, set-up, operation and fusion procedure, and shall re-make the rejected fusions. Testing of large diameter fusion (>12") may require special equipment and safety precautions.

B. Leak Testing.

1. Hydrostatic leak testing shall be conducted in accordance with ASTM F2164.
2. Pneumatic pressure testing is prohibited.

End of Section

SECTION 02640

VALVES

PART 1: GENERAL

A. Not used.

PART 2: PRODUCTS

2.01 Combination Sewage Air Relief Valves

A. The CONTRACTOR shall furnish and install combination sewage air relief valves in accordance with the schedule provided on the contract drawings.

B. Unless otherwise identified on the schedule all valves shall be equivalent to Figure 942-F valves with back flushing accessories as manufactured by GA Industries, LLC, Cranberry Township, PA USA.

C. The combination air valve shall consist of a large orifice and a small orifice housed in a single body. The large orifice shall vent air and sewage gas during the filling of a pipeline or system and automatically close when liquid rises in the valve. The small orifice shall automatically open as often as necessary to release small amounts of accumulated air and sewage gas while the system is pressurized. The large orifice shall re-open to admit air during draining or a negative pressure condition. The valve shall have an elongated body not less than 20" (508mm) tall suitable for use with sewage, wastewater or other "dirty" fluids and be of the float operated, compound lever type with an adjustable seat.

D. The valve's large orifice diameter shall be no less than the nominal size of the valve as shown on the plans and/or in the valve schedule. Valves 3" and smaller shall have NPT inlet and outlet connections and 1" size valves shall have a 2" inlet connection (2" x 1") to minimize plugging. Sizes 4" and 6" shall have a flanged inlet and NPT outlet connections. The small orifice shall be suitable for working pressures up to 150 PSI.

E. There shall be an additional plugged 2" NPT cleanout connection near the bottom and plugged ½" NPT connections near the top and a 1" NPT connection near the bottom for testing, draining and/or the installation of back flushing accessories.

F. The valve body and cover shall be rated for 200 PSI, made from cast iron conforming to ASTM A126 Class B and shall be shop coated with enamel primer. The float ball, internal trim and linkage mechanism shall be made from Type 316 stainless steel. The seat shall be replaceable and made from Buna-N rubber or other suitable elastomer compounds.

G. The air release valve shall be supplied with back flushing accessories consisting of a bronze ball valve for inlet isolation, a 1" ball valve for draining and a ½" ball valve for flushing, quick connect couplings and a minimum of 5 ft. of rubber hose.

2.02 PLUG VALVES

A. Plug valves shall be furnished as indicated on the contract drawings. Plug valves shall be quarter-turn, non-lubricated, eccentric type with resilient faced plug for wastewater service with pressure up to 175 psig. Eccentric Plug Valves shall be Series 5800R (Flanged) as manufactured by Val-Matic Valve & Manufacturing Corporation, Elmhurst, IL. USA, or equal.

B. The valve body and cover shall be constructed of ASTM A126 Class B cast iron for working pressures up to 175 psig. The words "SEAT END" shall be cast on the exterior of the body seat end. The plug shall be of one-piece construction and made of ASTM A126 class B cast iron with a resilient facing per ASTM D2000-BG and ANSI/AWWA C504 requirements. Radial bearings shall be constructed of self-lubricating Type 316 stainless steel. The top thrust bearing shall be Teflon. The bottom thrust bearing shall be Type 316 stainless steel. Cover bolts shall be corrosion resistant with zinc plating. Valves shall have flanges with drilling to ANSI B16.1, Class 125.

C. Port areas of not less than 85% or pipe area shall be provided on valves. The valve seat shall be a welded overlay or 99% pure nickel applied directly to the body on a pre-machined, cast seating surface and machined to a smooth surface. Shaft seals shall conform to ANSI/AWWA C504 and consist of V-type packing in a fixed gland with an adjustable follower designed to prevent over compression of the packing and to meet design parameters of the packing manufacturer. Permanently lubricated, shaft bearings shall be supplied in the upper and lower bearing journals. Thrust bearings shall be provided in the upper and lower journal areas. Both the packing and the bearings in the upper and lower journals shall be

protected by a Grit-Guard™ shaft seal located on the valve shaft to minimize the entrance of grit into the bearing journals and the shaft seal areas.

D. All 4" and above valves shall be supplied with totally enclosed and sealed worm gear actuator with position indicator and externally adjustable open and closed stops. The worm segment gear shall be ASTM A536 Grade 65-45-12 ductile iron with a precision bore and keyway for connection to the valve shaft. Bronze radial bearings shall be provided for the segment gear and worm shaft. Alloy steel roller thrust bearings shall be provided for the hardened worm. All gear actuators shall be designed to withstand, without damage, a rim pull of 200 lb. on hand wheel.

E. Valves shall be marked with the Serial Number, Manufacturer, Size, Cold working pressure (CWP), and the Direct and Reverse Actuator Pressure Ratings on a corrosion resistant nameplate. The exterior of the valve shall be coated with a universal primer.

F. The valves shall be proof of design tested in accordance with ANSI/AWWA C504. When requested, the manufacture shall provide test certificates.

PART 3: EXECTION

A. Not used.

End of Section

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SECTION 02730

PIPED WASTEWATER SEWER

PART 1: GENERAL

1.01 RELATED WORK

A. Excavating Backfilling and Compacting: Section 02220

B. Manholes: Section 02731

1.02 QUALITY ASSURANCE

A. Design Criteria:

1. Use one type and class of pipe in continuous line of sewer between structures, unless otherwise indicated on the Drawings.

2. Use pipe and fittings designed to withstand imposed trench loadings and conditions at the various locations.

1.03 SUBMITTALS

A. Shop Drawings and Product Data: Submit completely dimensioned shop drawings, catalog cuts and such other data as required to provide complete descriptive information for the following:

1. Sewer Pipe and Fittings
2. Piping Specialties
3. Service Connection Pipe and Fittings

B. Certificates:

1. Certified records or reports of results of shop tests, such records or reports to contain a sworn statement that shop test have been performed as specified.

2. Manufacturer's sworn certification that pipe will be manufactured in accordance with specified reference standards for each pipe type.

1.04 PRODUCT DELIEVERY, STORAGE AND HANDLING

A. Transport, handle and store pipe materials and the associated materials specified herein, in the manner recommended by the respective materials manufacturers so as to prevent damage and defects to their respective materials.

1.05 SITE CONDITIONS

A. Environmental Requirements:

1. Keep trenches dewatered until pipe joints have been made and concrete cradle and encasement (as required) have cured.

2. Do not lay pipe in water or on bedding containing frost.

3. Do not lay pipe when weather conditions are unsuitable for pipe laying work, as determined by the ENGINEER.

PART 2: PRODUCTS

2.01 DUCTILE IRON PIPE PRESSURE SEWER

A. Ductile Iron Pressure Sewer Pipe: Provide pipe which is permanently marked with the manufacturer's trademark, size and pressures sewers (Force Mains) shall be fabricated conforming with the ANSI A21.50 and A21.51 specifications, Thickness Class 52.

1. The ductile iron pipe shall be finished with a double cement mortar lining coated per ANSI A21.4 and shall be coated with a standard bituminous coating.

2. Fittings shall also be fabricated of ductile iron conforming to ANSI A21.10 or A21.53 (short body) (gray iron fittings are not acceptable). All pipe fittings shall be furnished with a double cement mortar lining per ANSI A21.4. Fittings shall be rated for at least 350 pounds per square inch (psi) service.

3. Pressure Sewers shall be anchored and/or blocked at all locations where bends and/or changes in

profile or alignment exceed 10°; concrete blocking and anchoring shall be as specified with Section 02151. Reference KLH Standard Detail SD-2-045 and SD-2-046.

2.02 POLYVINYL CHLORIDE (PVC) PIPE FOR PRESSURE SEWERS (14 INCH THROUGH 48 INCH DIAMETERS).

A. Pressure Sewer (Force Main) Pipe shall be unplastigized Polyvinyl Chloride (PVC) Pressure Pipe with integral bell and spigot joings, and shall be rated 200 psi meeting the requirements of DR21. Provide pipe which is permanently marked with the manufacturers trademark, and size. Pipe shall meet AWWA C905 ANSI/UL 1285 (14" - 24").

1. All pipe shall be made from quality PVC resin, compounded to provide physical and mechanical properties that equal or exceed Class 12454 as defined in ASTM D1784.

2. All pipe shall be suitable for use as pressure conduit. Provisions must be made for expansion and contraction at each joint with an elastomeric ring. The bell shall consist of an integral wall section with a locked in solid cross section elastomeric ring which meets the requirements of ASTM F-477. The bell section shall be designed to be at least as hydrostatically strong as the pipe wall and meet the requirements of AWWA C905 and Section 6.2 of ASTM D3139 "Standard Specification for Joint for plastic pressure pipes using Flexible Elastomeric Seals." Sizes and dimensions shall be as shown in the Contract Drawings.

3. Standard laying lengths shall be 20 feet (plus or minus 1") for all sizes. At least 85% of the total footage of pipe of any class and size shall be furnished in standard lengths. The remaining 15% can be furnished in random lengths. Random lengths shall not be less than 10 feet long. Each standard and random length of pipe shall be tested to four times the class pressure of the pipe for a minimum of 5 seconds. The integral bell shall be tested with the pipe.

;

4. PVC Pipe installation cautions:

   a. Check to see that the gasket is properly seated in the bell groove, and that the bell and spigot are clean before assembly.

   b. Apply the approved lubricant supplied with the pipe to the spigot end of the pipe, paying particular attention to the bevel. The coating should be equivalent to a brush coat of enamel paint.

   c. Assemble the joint only to and not over the assembly mark provided on the spigot end.

   d. If undue resistance to insertion of the spigot is encountered, or the assembly mark does not reachthe flush position, disassemble the joint and check the position of the rubber gasket, and remove any debris.

   e. The angular deflection at the joint shall be maximum of 1.5 degrees. This will produce an offset in a 20' section of approximately 6 ¼ inches. Joint deflection is achieved after the joint is assembled in sraight alignment in straight alignment and to the reference mark.

   f. Prior to backfilling, check to see that the assembly mark is flush with the end of the bell.

5. Fittings shall be Pressure Class 350 and be fabricated of Ductile Iron conforming to the latest revision of ANSI/AWWA/C110/A21.10 or A21.53 (short body) (gray iron fittings not acceptable. All pipe fittings shall be furnished with a double cement mortar lining per ANSI/AWWA/C104/A21.4 specifications.

6. All buried Fitting and Valves shall be installed with retaining glands (Megalugs or an approved equal) having stainless steel head bolts, studs and nuts.

7. Force mains shall be anchored and/or blocked at all locations where bends and/or changes in profile or alignment exceed 10°; concrete blocking and anchoring shall be as specified in Section 02151. Reference KLH Standard Detail SD-2-045 and SD-2-046.

PART 3: EXECUTION

3.01 INSPECTION

A. Inspect each section of pipe and each pipe fitting before laying in conformance with the inspection requirements of the appropriate referenced standard.

B. Remove rejected products from the project site.

3.02 PREPARATION

A. General Requirements:

1. Clean piping interior prior to laying pipe and following pipe laying.

2. Keep open ends of piping and pipe attachment openings capped or plugged until actual connection or actual pipe testing. Prevent water and debris from washing into the pipe.

3. Excavate trenches in rock at least 25-feet in advance of pipe laying.

B. Earthwork: Perform earthwork for sewer installation as specified in Section 02220.

3.03 SEWER CONSTRUCTION METHODS

A. General Requirements: Use proper and suitable tools and appliances for the proper and safe handling, lowering into trench and laying of pipes.

1. Lay pipe proceeding upgrade true to line and grades given. Lay bell and spigot pipe with bell end upgrade. Lay tongue and groove pipe with groove end upgrade.

2. Exercise care to insure that each length abuts against the next in such manner that no shoulder or unevenness of any kind occurs along inside bottom half of pipe line.

3. No wedging or blocking permitted in laying pipe unless by written order of ENGINEER.

4. Before joints are made, bed each section of pipe full length of barrel with recess excavated so pipe invert forms continuous grade with invert of pipe previously laid. Do not bring succeeding pipe into position until the preceding length is embedded and securely in place.

5. Dig bell holes sufficiently large to permit proper joint making and to insure pipe is firmly bedded full length of its barrel.

6. Walking or working on completed pipe line, except as necessary in tamping and backfilling, is not permitted until trench is backfilled one-foot deep over top of pipes.

7. Take up and relay pipe that is out of alignment or grade, or pipe having disturbed joints after laying.

8. Take up and replace with new, such in place pipe sections found to be defective. No additional compensation paid for replacement work.

9. Bedding materials and concrete work for pipe bedding as specified in the Contract.

B. Pipe Laying and Joining: Perform pipe laying and joining in strict accordance with manufacturer's installation instructions, reference standards as included, and such additional requirements as specified herein.

1. Make joints absolutely watertight and immediately repair detected leaks and defects. Methods of repair subject to Engineer's approval.

2. Laying/Joining Ductile Iron Pipe: Installation and joint assembly according to AWWA C 600, and as follows:

a. Where necessary to field cut pipe use approved pipe cutter, milling cutter or abrasive wheel saw.

3. Laying/Joining Specified Types of Plastic Pipe: Installation and joint assembly according to ASTM D. 2321 requirements and bedding materials as specified herein.

3.04 FIELD QUALITY CONTROL

A. General Requirements: Conduct tests specified herein so that each pipe line stalled in the Project is tested to the Engineer's satisfaction.

1. Provide tools, materials (including water and temporary fittings), apparatus and instruments necessary for pipe line testing.

2. Conduct tests in the presence of and to the satisfaction of the ENGINEER.

3. A testing schedule.

4. A listing of equipment intended to be used, including general information on the pump, pressure gauge, pressure relief and water meter.

5. Certification that the pressure gauge has been calibrated to 0.1 psi.

6. Maintain testing records on a form provided by the ENGINEER and the CONTRACTOR, shall be required to certify that all such testing has conformed with the specified test conditions and requirements.

B. Testing Equipment:

1. Use air compressing apparatus equipped with a control panel with necessary piping, control valves and gauges to control air flow rate to piping test section; and to monitor air pressure within piping test section and air pressure within test section seal plugs. To prevent accidental overloading of piping test section,

provide air compressing apparatus with an approved pressure relief device set to relieve at ten psi.

2. Provide an extra pressure gauge of known accuracy to frequently check test equipment and apparatus.

3. Air testing equipment and associated testing apparatus subject to Engineer's approval.

C. Cleaning Prior to Test: Before tests are conducted, flush piping including sewers, branches and service connections until free of all forms of dirt and construction debris.

1. The water for the flush cleaning operation shall be from the CONTRACTOr's source.

2. A plug shall be installed in the new sewer connecting into the existing sewer system to preclude any water and debris from the flushing operations from entering the existing sewer system.

3. CONTRACTOR shall be responsible to remove and dispose of all flushing water, debris, dirt, etc., from the new sewer system.

4. New sewer shall remain plugged until the new sewer system is accepted by the OWNER.

D. Force Main (Pressure Sewer) Line Acceptance Test: After the pipe line had been constructed, restrained, anchored and blocked, backfilled and successfully cleaned, Perform line acceptance test specified herein.

1. A hydrostatic test shall be conducted at a pressure of a minimum of 150 pounds per square inch at any point of testing. The time period of said test shall be not less than two hours and the pressure shall not vary by more than plus or minus 5 psi during the entire period of the test. All air shall be completely expelled from the section of line to be tested, prior to application of the test pressure.

2. No section of pipeline will be accepted if, as a result of the aforementioned hydrostatic test, leakage is greater than an amount determined by the following formula:

$$L = \frac{SD\ (P)^{0.5}}{133,200}$$

L: Allowable leakage, gallon per hour
S: Length of pipe tested, feet
D: Diameter of pipe, inches
P: Average test pressure, pounds per square inch

3. If the testing of any section of line discloses leakage greater than the amount, the CONTRACTOR shall, at his sole expense, locate the problem and make all necessary repairs and retest until the pipeline conforms with the specified allowance. Any and all visible leaks which are detected shall also be repaired, regardless of the amount of leakage.

4. All force main shall also be hydrostatically tested for leakage after installation is completed. Said testing shall be performed in accordance with the applicable sections of the AWWA C600 standards. Each section of pipe to be tested shall be slowly filled with water during which time air shall be expelled from the pipeline through the air release valves (where high points in the line exist at which there are no air release valves, CONTRACTOR shall install corporation cocks for the purpose). After all air is expelled, the air release devices shall be closed and line pressures shall be raised to the test pressure directed by the ENGINEEER. Test pressures shall be 1.5 times the expected working pressure predicted upon the elevation of the lowest point in the line, corrected to the elevation of the test gauge. Any joint, fittings, valves, cracked pipe or other appurtenances revealing leakage during the pressure test shall be corrected, after which the pressure test shall be rerun. Pressure tests shall be conducted for a 30 minute time period.

5. After performance of the successful pressure test, a leakage test shall be performed over a duration period of two hours at a pressure to be determined by the ENGINEER. Leakage is defined as the quantity of water supplied to the test section of pipe, which is required to maintain pressure within 5 psig of said test pressure during the entire testing period. Pipe construction so tested shall be deemed to have failed the leakage test if the leakage resulting is greater than 10 gallon per inch diameter per mile of pipe per day.

E. Repair and Retest: When sections of sewer fails to meet test requirements specified previously:

1. Determine source or sources of leakage.

2. Repair or replace defective material, if as result of improper workmanship, correct such.

3. Take up and relay pipe sewer line section that has more than the maximum allowable deflection.

4. Conduct additional test required to demonstrate that sewer line meets specified test requirements.

F. The OWNER reserves the right to retest at his expense, any piping throughout the duration of the Construction Period.

1. CONTRACTOR shall make repairs as Work of this Contract to piping found defective by such Owner conducted tests.

End of Section

SECTION 02731

MANHOLES

PART 1: GENERAL

1.01 WORK INCLUDED

A. The CONTRACTOR shall furnish and install where shown on the drawings, precast concrete manholes. The CONTRACTOR shall consult KLH Standard Detail SD-2-007, and SD 2-010, and bound with this contract specification for the details of construction. Manhole diameters shall be 4'-0" diameter unless noted otherwise.

1.02 RELATED WORK

1. Excavation, Backfilling and Compaction, Section 02220
2. Piped Wastewater Sewer, Section 02730
3. Division 3 Concrete

1.03 QUALITY ASSURANCE

A. Source Quality Control:

1. Maintain uniform quality of products and component compatibility by using the products of one manufacturer for precast reinforced concrete manholes.

2. Obtain certificate of construction compliance with ASTM C 478 from the precast reinforced concrete manhole manufacturer. Submit this certificate as part of required submittals.

3. Obtain certificate of material compliance with ASTM A 48, Class 30 tensile strength from the manhole frame and cover manufacturer. Furnish certification that tensile test bars were from same pour as castings. Submit the certificate as part of required submittals.

1.04 SUBMITTALS

A. Shop Drawings and Product Data:

1. Submit manufacturer's published detail drawings, modified to suit design conditions if required, and

CONTRACTOR prepared drawings as applicable, for each product specified herein.

2. Submit manufacturer's description literature and specifications for each product specified herein. Include installation information.

B. Certificates:

1. Certified records or reports of results of shop tests, such records or reports to contain a sworn statement that shop tests have been made as specified.

2. Manufacturer's sworn certification that components and products will be manufactured in accordance with specified reference standards for components and products.

3. Manufacturer's sworn certification that manhole frame and cover tensile test bars were poured from the same iron as castings they represent.

1.05 DELIVERY, STORAGE AND HANDLING

A. Transport and handle precast reinforced concrete manhole components, and other products specified herein, in a manner recommended by their respective manufacturers to prevent damage and defects. Through-wall lifting holes are not permitted in manhole component construction.

B. Store precast reinforced concrete manhole components in accordance with their manufacturer's recommendations to prevent joint damage and contamination. Exercise such care in storage of other specified products as recommended by their respective manufactures.

1.06 SITE CONDITIONS

A. Environmental Requirements

1. Do not set or construct manhole bases on subgrade containing frost.

PART 2: PRODUCTS

2.01 BASIC MATERIALS

A. Cast-In-Place Concrete Products: Formwork, Reinforcement, and Cast-In-Place Concrete conforming requirements of Division 3-Concrete.

B. Waterproofed Mortar: Mortar material composition shall meet the requirements of ASTM C 270, for Type M mortar with waterproofing admixture included.

1. Acceptable Manufacturers:

a. Medusa Cement Company; Medusa Waterproofing Paste or Power.
b. Grace Construction Materials; Hydratite
c. Chem-Master Corporation; Hydrolox
d. Or Equal.

C. Epoxy Bonding Compound: Provide a high-modulus, low viscosity, moisture insensitive epoxy adhesive having the following characteristics.

1. Mix Ratio: 100 percent solids, two-component; mixed one part by volume component B to two parts by volume component A.

2. Ultimate Compressive Strength; 13,000 psi after cure at 73 degrees F. and 50 percent relative humidity determined in accordance with ASTM D 695.

3. Acceptable Manufacturers:

Sika Corporation: Sikadur Hi-Mod.
Euclid Chemical Company; No. 452 Epoxy System.
A.C. Horn, Inc., Epoxtite Binder.
Or Equal.

D. FRAMES AND COVERS

1. Standard Manhole frames and covers shall be heavy duty cast iron designed for AASHTO Highway Loading Class H-20 and to fit the precast top section of the manhole; frame shall be anchor bolted to conical top section or slab. The frame and cover for the manhole will be fabricated of cast iron and conform to the details of KLH SD 2-019. Frames and covers shall be NEENAH R-1753 with self sealing lids. The covers shall having lettering identifying

the "OWNER and SEWER" or "WATER", "ELECTRIC" OR "VALVE" shall be cast in the cover as applicable. Four ¾" anchor bolts shall be provided for each frame. The final setting of manhole castings shall be such that they conform with the existing ground slopes and shall be set to exclude surface water. Contact surfaces of frames and covers shall be machined so that covers rest securely in the frames. Frames and covers shall be coated with a corrosion resistant bitumastic material which shall be smooth and durable and will not chip off.

2. Watertight Manhole Frames and Covers shall be Neenah R-1755-F2 complete with Neoprene Gasket, bronze tightening bolt and channel locking bar or an approved equal. Frame and cover shall conform to the details of KLH SD-2-020. Frames and covers shall be machined so that covers rest securely in the frames. Frames and covers shall be coated with a corrosion resistant bitumastic material which shall be smooth and durable and will not chip off. The covers shall have lettering identifying the "Owner and Sewer" or "Owner and Water".

E. MANHOLE BASE

1. Manhole base constructed with cast-in-place concrete shall conform to the American Concrete Institute's Standard 614. The entire interior surface area of the concrete base shall have a steel trowel finish. The bottom section of the precast barrel section shall be completely encased with Class "A" concrete for a distance of 6 inches above the crown of the incoming sewer pipe, or a minimum of 12 inches above the bottom of the precast section. The precast barrel against which the concrete is being deposited shall be "wetted" before placing the concrete and the joint between the barrel wall and the freshly placed concrete shall be worked with a steel trowel to minimize shrinkage cracking which may occur. The slump of the concrete used for encasement shall not exceed 2 inches.

F. PIPE CONNECTIONS

1. Sanitary sewer pipe connections shall be watertight and shall be installed during the precasting process and shall as manufactured by A-Lok or an

approved equal. See Standard Details for specific pipe connector.

G. LADDER BARS

1. Ladder bars shall be twelve inches wide on twelve inch centers cast in the manhole wall at the time that the concrete barrel section is made; steps shall be reinforced plastic step: composed of 3/8 inch grade 60, ASTM A 615 deformed steel reinforcing bar completely encapsulated in grade 49108, ASTM D 401 Polypropylene Compound, Type II; MA Industries Inc. or equal.

H. COATINGS

1. The exterior surface of all manholes, and other concrete vaults shall be coated and waterproofed with two coats of bitumastic material or coal tar. Each coat shall have a minimum dry film thickness of 8 mils.

I. CONCRETE SEALANT

1. Concrete Sealant shall be used between joints at precast concrete manholes. Material shall be flexible Butyl Resin Sealant meeting the requirements of Federal Specifications SS-S-210 (210A), AASHTO M-198B, and ASTM C-990-91. Material shall be ConSeal or an approved equal.

J. MANHOLE LINER

1. All manholes where identified in the Contract Drawings shall have installed a continuous impermeable Polyvinyl Chloride (PVC) Resin Liner. Liner system shall be Dura Plate 100 as manufactured by A-Lok or an approved equal and the PVC color shall be white.

   a. The design of the liner shall insure that it will conform to the contour of the structure and form a permanent mechanical bond to the concrete through use of preformed horizontal ribs. The liner will be formed in such a manner that the joints between the structure sections will be afforded protection through the use of a continuous PVC return into the joint for a minimum ¾ of an inch.

b. Provisions shall be made to allow the pipe openings to be lined and sealed.

c. The PVC Resin compound shall provide a semi-rigid material suitable for thermoforming to the contour of the structure. The liner may be fabricated in panels with the panels joined together by a slotted strip of EPDM rubber according to the manufacturers specifications. All plastic liner sections shall be free of cracks, pinholes or other defects adversely effecting the protective characteristics of the material and shall have a minimum thickness of 65 mils.

d. The structure will be installed using a butyl rubber joint material in accordance with the manufacturers installation specifications. The joint material shall be placed on the joint surfaces to provide a watertight seal by filling the annular cavity, while providing sufficient squeeze-out between the PVC returns to protect against corrosion. The dimension of the butyl rubber will be 5/8" by 3-1/2" or as recommended by a liner manufacturer.

e. There shall be no ladder bars in manholes having a plastic liner.

K. INFLOW PROTECTORS:

1. The CONTRACTOR shall furnish and install plastic inflow protectors at all manholes not having a watertight frame and cover. Plastic inflow protectors shall be fabricated to fit the specified frames and covers. Inflow protectors shall be fabricated of a material which will not corrode or otherwise be adversely affected by the sewage atmosphere and shall be provided with a gas relief valve. They shall be similar to KLH Standard Detail SD-2-017 or approved equal.

2.02 PRECAST REINFORCED CONCRETE MANHOLE COMPONENTS

A. Materials and Construction: Conforming to requirements specified in ASTM C 478 except as follows:

1. Concrete: Composition and compressive strength conforming to ASTM C 478 except use Type II or Type III cement in manhole components and increase

compressive strength to 4500 psi (at 28 days) in precast bases.

2. Casting and Curing: Wet cast and steam curing process in accordance with Section 3.6.11 and 3.7.2 of AWWA C 302.

3. Manhole Steps: Factory installed in manhole components, prealigned vertically, spaced on equal centers, and located the minimum distance from ends of risers and top sections as indicated on Drawings.

4. Manhole Component Seals: Manhole component joints factory formed for self-centering concrete to concrete bearing employing a flexible Butyl Resin Sealant.

5. Manhole Component Design: Designs shall conform to ASTM C 478. Base, tapered and straight riser section, and top sections dimensions and diameters, not consistent with ASTM C 478, are as indicated on Drawings.

6. Lifting Holes and Lugs: Through-wall lifting holes not permitted in manhole component construction. Factory-install lifting keys or lugs integrally in manhole components.

B. Precast Bases and Riser Sections: Design, materials and construction as specified previously.

C. Pipe Openings: Custom preformed during manufacturing in each base and riser section requiring a pipe opening. Preform the opening to accommodate the type of pipe and pipe opening seal required.

1. Prefabricated Pipe Opening Seals: Resilient gasket type, conforming to requirements specified in ASTM C 923.

D. Precast Top Sections: Designs as required by the Drawings, and of materials and construction as specified herein, except additional and differing requirements as follows:

1. Hold Down Bolt Inserts: Factory cast the inserts in the top section with four (4) ¾ inch threaded inserts or slotted inserts to accommodate manhole frame hold down bolts. Provide threaded inserts of

three inches depth and designed for an ultimate load in tension of 12,500 pounds. Inserts factory plugged for shipping. Coordinate insert locations in the top sections to match the bolt hole locations in the manhole cover frames.

2. Flat Slab Tops: Thickness versus diameter is as indicated on the Drawings. Tops factory formed to properly accept and support required manhole cover frame and properly formed underside to join the top section to the riser section in a matching joint.

3. Eccentric Cone Tops: Provide precast tops of the same minimum wall thickness and with same area of circumferential steel reinforcement as riser sections.

E. Precast Grade Rings: Leveling and adjusting units of three inches or four inches thickness and of materials and construction as specified. Provide precast grade rings with hold down bolt holes matching location of bolt holes in manhole cover frame. The design shall provide for full bearing of manhole cover frame.

PART 3: EXECUTION

3.01 INSPECTION

A. Inspect precast reinforced concrete manhole components in accordance with requirements of ASTM C 478 regarding repairable defects and defects subject to rejection by the ENGINEER.

3.02 PREPARATION

A. Keep pipe and manhole interiors cleared of debris as construction progresses.

B. Earthwork: Perform earthwork for manhole installation as specified in Section 02220.

3.03 MANHOLE CONSTRUCTION METHODS

A. Cast-In-Place Manhole Base: Construct in accordance with design and dimensions indicated on Drawings. When necessary to construct wider or deeper manhole bases than indicated or specified, build such bases as required by the ENGINEER.

1. Form and pour concrete in accordance with requirements of Division 3 - Concrete. Additional requirements as follows:

    a. Vibrate poured concrete using mechanical vibrator of a type and design approved by ENGINEER. Use vibrators of type capable of transmitting vibration to concrete in frequencies of not less than five thousand impulses per minute.

    b. Form and pour joint monolithically in manhole base top to match joint of adjoining precast riser section. Use template as obtained from precast concrete manhole component manufacturer of manhole components used in the Project.

2. Install sewer piping in cast-in-place manhole bases prior to pouring the concrete.

    a. Apply Epoxy Bonding Compound in accordance with manufacturers instructions to pipe at base connection prior to pouring the concrete.

    b. Install PVC Waterstop on pipes entering and leaving manhole base prior to pouring concrete. Install PVC Waterstop in accordance with manufacturer's written instructions.

3. Use Class A (4000 psi) concrete as specified in Section 03300, unless indicated otherwise on Drawings.

B. Precast Concrete Manhole Bases: Install bases on a 6-inch deep compacted layer of aggregate meeting requirements of Bedding as specified in Section 02220.

1. When using Prefabricated Pipe Opening Seals for connecting pipes into manholes, and such seals create an annular space on interior and exterior of manhole wall pipe openings after pipe connection is made, fill such annular spaces with Preformed Plastic Sealing Compound.

    a. Tightly caulk sealing compound into annular spaces in a manner to completely fill the spaces and render the installation watertight.

b. Following sealing compound installation, trowel compound surface smooth and flush with interior face of manhole.

C. Length of Pipe Connections into Manholes:

1. Use pipes no longer than five feet in length when connecting into manholes through Prefabricated Pipe Opening Seals.

2. For all other pipe connections into manholes, use pipes of such length that a pipe joint is provided at the outside edge of manhole base or wall as applicable. Also use pipes no longer than 6 feet in length of first pipe joined thereto.

D. Concrete Channel Fill: Field pour and form concrete channel fill for each manhole base except in the case where precast bases are used, factory preformed channels may be provided.

1. Form inverts directly in concrete channel fill.

2. Accurately shape invert to a semi-circular bottom conforming to inside of connecting pipes, and steel trowel finish to a smooth dense surface.

3. Make changes in size and grade gradually.

4. Make changes in direction of entering sewer and branches to a true curve of as large a radius as manhole size will permit.

5. In terminal manholes, install concrete channel fill formed channel extending from down stream pipe opening directly across the base to future pipe opening on upstream side of the base.

6. Make slopes gradual outside the invert channels.

7. Use Class B (3000 psi) concrete as specified in Section 03300, unless indicated otherwise on Drawings.

8. When precast bases with preformed channels are used, fill the annular space at the pipe connections, on both sides of the wall, with non-shrink non-metallic grout as specified in Section 03600.

9. The size and depth of the inverts will vary to suit the size of the pipe used and shall have a height of at least 6 inches higher than the springline or to the top of the inlet pipe, which ever is higher.

E. Manhole Wall Erection: Provide precast reinforced concrete straight riser, tapered riser and top sections necessary to construct complete manholes. Fit the different manhole components together to permit watertight jointing and true vertical alignment of manhole steps.

1. Install flexible butyl resin between joints in accordance with the manufacturer's recommendations.

F. Lifting Recess Sealing: Seal with properly designed tapered rubber plugs. Drive plugs into recesses in such manner to render them completely water and air tight. Sealing of lifting recesses with grout not permitted.

G. Frame and Cover Installation: Where required, make final adjustment of frame to elevation using materials selected under Contractor Options In Products.

1. Set precast grade rings, bricks or concrete masonry units in Waterproofed Mortar. Wet, but do not saturate concrete masonry units and precast grade rings immediately before laying. Saturate brick immediately before laying.

2. Precast grade ring: Pre-set to proper plane and elevation using wedges or blocks or cementitiuos material not exceeding the joint thickness. No more than four wedges or blocks per grade ring permitted. Incorporate wedges or blocks in fresh mortar in a manner to completely encase each. Crown fresh mortar to produce squeeze-out between grade rings. Tool exposed joints with appropriately shaped tool and compact mortar edge into joints. Clean off excess mortar prior to initial mortar set.

3. Concrete Masonry Leveling Unit: Lay segmental concrete masonry units to line and in radial courses with completely filled mortar joints. Flush cut exposed horizontal and vertical joints on manhole interior and exterior. Leave exterior surface ready for parging.

4. Brick Leveling Units: Lay brick to line and in header courses. Lay each course to stagger one half brick over previous course. Completely fill joints and make close joints not exceeding ¼ inch on inside face of manhole. In making closures, use no portion of a brick less than the width of a brick, and whenever practical use whole brick laid with long side at right angles to inside face of manhole wall. Finish brick work with long side at right angles to inside face of manhole wall. Finish brick work with neatly struck and pointed joints. Clean brick work by removing mortar smears and drippings.

5. Parge the outside of finished brick or concrete masonry leveling units with a minimum of ½ thick waterproofed mortar.

6. Bolt manhole frames in place on manhole top section, or leveling units with a minimum of ½ inch thick preformed plastic sealing compound on bearing surface of manhole frame. Remove excess sealing compound squeeze-out after manhole frame is bolted in place.

7. Use bolts of sufficient length to properly pass through leveling units, if any, engage full depth of manhole top section inserts and allowing enough threaded end to pass thourgh manhole frame to properly tighten nut and washer. Tighten manhole frame bolts after mortar has cured.

H. Plugging Pipe Openings: Plug pipe openings in manholes where such openings are required for future pipe connections.

1. Use masonry units and waterproofed mortar laid up to prevent deterioration.

2. Install such materials to meet exfiltration limits and to allow future removal without damage to manhole.

I. Drop Manholes: Construct in accordance with Type indicated in Standard Details or bound in the Contract Drawings. Use the same type pipe and fittings in drop connection as used in the sewer line from which drop connection is made.

3.04 FIELD QUALITY CONTROL

A. General: After erection of the manholes, connection of the sewers, and placement of the backfill to approximately the finished ground elevation, each manhole shall be vacuum tested for water tightness.

1. Conduct tests in presence of, and to complete satisfaction of the ENGINEER.

2. Should a manhole not satisfactorily pass testing, discontinue manhole construction in the Project until that manhole does test satisfactorily.

3. Provide tools, materials (including water), equipment and instruments necessary to conduct the manhole testing specified herein.

   a. Vacuum Testing Equipment:

      1). Use vacuum apparatus equipped with necessary piping, control valves and gauges to control air removal rate from the manhole and to monitor vacuum.
      2). Provide an extra vacuum gauge of known accuracy to frequently check test equipment and apparatus.
      3). Vacuum testing equipment and associated testing apparatus are subject to ENGINEER's approval.
      4). Provide seal plate with vacuum piping connections for inserting in manhole frame.

4. Prior to testing, clean manholes thoroughly and seal openings, both to the complete satisfaction of the ENGINEER. Seal openings using properly sized plugs.

5. Perform testing with frames installed. Include the joint between the manhole and manhole frame in the test.

6. The CONTRACTOR may elect to make a test for his own purposes prior to backfilling. However, conduct tests of the manholes for acceptance, only after the backfilling has been completed.

B. VACUUM TEST PROCEDURE:

1. Perform vacuum testing in accordance with the testing equipment manufacturer's written instructions.

2. Draw a vacuum of ten inches of mercury and close the valves.

3. Consider manhole acceptable when vacuum does not drop below nine inches of mercury for the following manhole sizes and times:

   a. Four foot diameter - 60 seconds.
   b. Five foot diameter - 75 seconds.
   c. Six foot diameter - 90 seconds.
   d. Seven foot diameter - 105 seconds.

C. Repair and Retest: Determine source or sources of leaks in manholes failing acceptable limits.

1. Repair or replace defective materials and workmanship, as is the case, and conduct such additional Manhole Acceptance Tests and such subsequent repairs and retesting as required until manholes meet test requirements.

2. Materials and methods used to make manhole repairs shall meet with ENGINEER's approval prior to use.

3. Make repairs, replacements and retests at no increase in Contract Price.

End of Section

SECTION 02732

MANHOLE VAULTS

PART 1: GENERAL

1.01 Vaults shall be precast concrete manholes having a diameter of five feet unless otherwise noted in the Contract Documents. Structures shall house air and vacuum relief valves. Vaults shall conform to KLH standard detail SD-2-041.

1.02 RELATED WORK

A. Excavation, Backfill and Completion - Section 02300.
B. Manholes - Section 02731
C. Division 3 - Concrete

1.03 QUALITY ASSURANCE

A. Source Quality Control; Manhole Frames and Covers:

1. As specified in Section 02601 for watertight manhole frames and covers.

B. Precast Concrete Products - Manhole Sections

1. As specified in Section 02601 for manholes.

1.04 SUBMITTAL

A. Shop Drawings and Product Data:

1. Manufacturers' published detail drawings, modified to suit design conditions if required, and Contractor prepared drawings as applicable.

2. Manufacturer's descriptive literature and specifications covering the product specified. Include installation information.

1.05 DELIVERY, STORAGE AND HANDLING

A. Transport and handle precast concrete vault components, and other products specified herein, in a manner recommended by their respective manufacturers to prevent damage and defects. Through-wall lifting holes are not permitted in chamber component construction.

B. Store precast concrete vault components in accordance with their manufacturer's recommendations to prevent joint damage and joint contamination. Exercise such care in storage of other specified products as recommended by their respective manufacturers.

PART 2: PRODUCTS

2.01 BASIC MATERIALS

A. Precast concrete manhole components meeting the requirements of ASTM C478 and shall include barrel sections, flat top and precast extended base.

B. Cast-In Place Concrete Products: Formswork, Reinforcement and Cast-In-Place Concrete conforming to requirements of Division 3-Concrete.

C. Watertight Manhole Frame and Cover: Gray iron castings conforming to previously specified requirements for Manhole Frame and Cover.

D. Manhole Steps:

1. Reinforced Plastic Step: Composed of a 3/8 inch Grade 60, ASTM A 615 deformed steel reinforcing bar completely encapsulated in Grade 49108, ASTM D 4104 Polypropylene Copolymer Compound, Type; M. A. Industries, Inc. or equal.

E. Concrete sealant: Flexible Butyl Resin Sealant meeting the requirements of federal specification ss-s210 (210A). AASHTO M-198B and ASTM C-900-91 and material shall be ConSeal or an approved equal.

F. Grout: As specified in Section 03600.

1. Non-shrink non-metallic grout.

G. Epoxy Bonding Compound: Use product such as W.R. Grace Epoxite Binder, Sika Chemical COLMA-FIX or equal.

H. Pipe Penetrations: Pipe Penetrations shall be watertight and shall be watertight type steel wall sleeves cast in the barrel section during the manufacturing process of the diameters required by the Construction Drawings, and shall have link seal installed in the field.

I. The exterior surface of all vaults shall be coated and waterproofed with two coats of bitumastic material or

coal tar. Each coat shall have a minimum dry film thickness of 8 mils.

J. After erection of the vaults and backfill to approximately finished ground elevation, each vault shall be vacuum tested for water tightness as specified in Section 02601.

PART 3: EXECUTION

3.01 VAULT CONSTRUCTION METHODS

A. Precast Concrete Manhole Vault Unit Installation: Install unit on a minimum six-inch deep compacted layer of Aggregate Fill.

1. Install Flexible Butyl Resin between sections, and to seal the top section on the chamber unit. Install sealing material in accordance with manufacturer's recommendations.

B. Manhole Steps and Frame and Cover Installation: As specified in Section 02601.

3.02 FIELD QUALITY CONTROL

A. General: After erection of the vaults, connection of the sewers, and placement of the backfill to approximately the finished ground elevation, each manhole shall be vacuum tested for water tightness.

1. Conduct tests in presence of, and to complete satisfaction of the ENGINEER.

2. Should a manhole vault not satisfactorily pass testing, discontinue manhole construction in the Project until that manhole does test satisfactorily.

3. Provide tools, materials (including water), equipment and instruments necessary to conduct the manhole testing specified herein.

a. Vacuum Testing Equipment:

1). Use vacuum apparatus equipped with necessary piping, control valves and gauges to control air removal rate from the manhole vault and to monitor vacuum.

2). Provide an extra vacuum gauge of known accuracy to frequently check test equipment and apparatus.

3). Vacuum testing equipment and associated testing apparatus are subject to ENGINEER's approval.

4). Provide seal plate with vacuum piping connections for inserting in manhole frame.

4. Prior to testing, clean manhole vault thoroughly and seal openings, both to the complete satisfaction of the ENGINEER. Seal openings using properly sized plugs.

5. Perform testing with frames installed. Include the joint between the manhole vault and manhole vault frame in the test.

6. The CONTRACTOR may elect to make a test for his own purposes prior to backfilling. However, conduct tests of the manholes for acceptance, only after the backfilling has been completed.

B. VACUUM TEST PROCEDURE:

1. Perform vacuum testing in accordance with the testing equipment manufacturer's written instructions.

2. Draw a vacuum of ten inches of mercury and close the valves.

3. Consider manhole vault acceptable when vacuum does not drop below nine inches of mercury for the following manhole sizes and times:

a. Four foot diameter - 60 seconds.
b. Five foot diameter - 75 seconds.
c. Six foot diameter - 90 seconds.
d. Seven foot diameter - 105 seconds.

C. Repair and Retest: Determine source or sources of leaks in manholes failing acceptable limits.

1. Repair or replace defective materials and workmanship, as is the case, and conduct such additional Manhole Acceptance Tests and such

subsequent repairs and retesting as required until manholes meet test requirements.

2. Materials and methods used to make manhole vault repairs shall meet with ENGINEER's approval prior to use.

3. Make repairs, replacements and retests at no increase in Contract Price.

End of Section

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SECTION 02910

SOIL TREATMENT

PART 1: GENERAL

A. Not Used.

PART 2: PRODUCTS

A. Not Used.

PART 3: EXECUTION

3.01 FINAL GRADING

A. All areas disturbed by the CONTRACTOR's operation, including those areas used for storage of excavated material, equipment, etc., shall be brought up to within 4 inches of the final grade indicated on the drawings by the methods therein before specified. In general, the grade shall slope away from the installed or existing structures to drainage ditches or culverts. Those areas which are not occupied by structures or pavement shall be thoroughly loosened by harrowing or discing and then raked by hand and all stones, over 1 inch, rubbish or debris shall be removed. Topsoil shall then be uniformly spaced in piles and distributed by an approved method.

B. The CONTRACTOR shall supply any additional topsoil required over and above that salvaged from the site in order to maintain a minimum of 4 inches. of depth over the entire area defined above if the area is to be seeded, or 4 inches of depth is the area to be sodded or planted. Any surface irregularities shall be corrected to prevent formation of low places where surface water may pool. Topsoil shall not be placed when the subgrade is frozen or when it is excessively wet or dry and shall not be handled when in a frozen or muddy condition.

3.02 TOP SOIL

A. The CONTRACTOR shall obtain topsoil from a local garden supplier or nurseryman for locations where existing topsoil is not of adequate quantity and

quality. The cost of furnishing and placing all such topsoil shall be included in the price bid for the respective pipe items.

B. Texture Classifications of top soil shall be in accordance with the Textural Classification System developed by the U.S. Department of Agriculture. Acceptable topsoil textures shall be within the following acceptable ranges, sand - 12% to 60%, silt- 15% to 65%, and clay - 0% to 23%, organic content shall be 4% minimum. Only soil additives approved by the OWNERS Representative shall be used to achieve the specified top soil quality.

3.03 SEEDING

A. All areas which are disturbed by construction operations, including equipment and materials storage, and which are not occupied by a roadway or permanent structure, shall be seeded with grass seed as follows:

B. After the topsoil has been properly distributed, lime in the form of raw ground limestone shall be applied in an amount to be determined from an analysis of the soil by a qualified soil sampling service; then one week after the lime has been spread, fertilizer shall be added. Fertilizer in the amount of 5-10-5, nitrogen phosphorus and potash, respectively, shall be spread at the rate of 30 lb. per 1000 sq. ft. after which a 1/4 in. layer of peat moss or mushroom manure shall be added. The entire area shall then be properly tilled and hand-raked to a smooth, even grade. All stones and dirt clods over 1 in. diameter shall be removed from the topsoil.

C. Permanent seeding shall consist of a mixture of 88% Kentucky 31 tall fescue and 12% red top, sown at the rate of 2 pounds per 1000 square foot. The area shall then be lightly brushed or raked to provide slight covering over the seed, after which it shall be lightly rolled in two directions.

D. All seeded areas shall be kept constantly wet to a depth of 3 in. for 10 days immediately after seeding. All areas which do not show prompt catch of grass shall then be reseeded as required. In any event, the

CONTRACTOR shall insure a good final stand of grass as specified above, and he shall maintain the seeded areas until the lawn, as such, is free from bare spots and off color areas and until final acceptance of the entire project.

E. Sowing may be done mechanically, by hand, or by an approved method of hydroseeding. In the latter case, alternate means of fertilizing in combination with seeding will be permitted on inaccessible areas and upon approval of methods by the OWNER's representative. Mulching material shall be in accordance with the recommendation of a local recognized nurseryman approved by the OWNER's representative.

End of Section

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DIVISION 3 - CONCRETE

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1: GENERAL

A. Not Used.

PART 2: PRODUCTS

2.01 PORTLAND CEMENT

A. Portland Cement shall conform to the Standard Specifications for Portland Cement of the American Society for Testing Materials, Serial Designation C-150, Type I or Type III. All cement shall be obtained from one source. Different brands of cement will not be permitted, except as previously specified. All cement shall be stored in a suitable manner to protect the cement from dampness in a manner to be easily inspected and to permit easy identification of each shipment. Facilities shall be provided for inspection and sampling of stored cement being used. The cement shall be rejected if it fails to meet any of the requirements of these specifications.

2.02 ADMIXTURES

A. All admixtures shall be approved by the OWNER, if he so desires, and shall be added to the concrete in strict accordance with the recommendation of the manufacturer. An air entraining admixture shall be added to all concrete for structures subjected to freeze-thaw conditions, such as sidewalks, outside liquid containing or liquid conveying vessels, concrete walls and roofs exposed to weather, etc. Admixture shall be added to the concrete to produce a 5% air content in Class A concrete and 6% air content in Class B concrete. Air content shall not vary more than 1% from the specified amount. An admixture similar to Type B or Type D, ASTM Standard C-494, shall be added to all Class A or Class B non-air entrained concrete unless other wise approved by the ENGINEER and shall be optional with Class C. This admixture shall contain no calcium chloride or

triethanolamine. Densifying retarders as manufactured by Sika Chemical Company, Master Builders Company or Dewey & Almy Corporation will be considered, provided the CONTRACTOR obtains the approval of the OWNER for the type to be used prior to the making of the trial mixes and further provided that they meet the requirements hereinafter specified.

2.03 WATER

A. Water used in mixing and curing concrete shall be fresh, clean and free from injurious amounts of sewage, oil, acid, alkali, organic matter or other deleterious substances. Water shall be approved for human consumption.

2.04 CONCRETE AGGREGATE

A. Concrete aggregate shall conform to the "Specifications for Concrete Aggregate", ASTM Designation C-33, except as revised. If requested, aggregate shall be certified by an independent commercial testing laboratory to show compliance with the above-mentioned Specifications.

B. Fine Aggregates: Only clean natural sand shall be used. Artificial or manufactured sand will not be acceptable.

C. Coarse Aggregates: Coarse aggregate shall consist of crushed stone conforming to the following limits:

1. Sodium Sulfate - 10% Maximum Loss
2. L.A. Abrasion Test - 35% Maximum Loss
3. Crushed Particles - 45% Minimum Loss

The sizes of coarse aggregate for the three types of concrete being used in this work as described hereafter, as follows:

Concrete	ASTM Size Number
Class A	467 or 57
Class B	67
Class C	2

D. The CONTRACTOR must utilize a crushed Limestone mix. Random samples of concrete delivered to the site will be washed to inspect the character of the coarse aggregate. At random selection aggregate samples taken at the construction site will be tested.

2.05 STORAGE

A. Cement and aggregates shall be stored in such a manner as to prevent deterioration or contamination with foreign matter. Fine and coarse aggregate shall be stored separately and in such a manner as to avoid segregation. Cement which has become caked, partially set, or otherwise deteriorated, or any material which has become damaged or contaminated, shall be rejected for use.

2.06 CONCRETE MIXES

Type	W/c Ratio Maximum	Minimum Cement Factor	28-Day Strength Characteristics	Maximum Slump (Inches)
Class A	0.45	6	4000 psi	3±
Class B	0.45	6-3/4	4500 psi	3±
Class C	0.59	5	2800 psi	3±

PART 3: EXECUTION

3.01 SCOPE OF WORK

A. All concrete which is to retain or exclude water and intended to be watertight shall be Class A. Class B concrete shall be used in walls and slabs 6 inches or less in thickness. It shall also be used for forming channels in the bottom of flumes and other similar structures and for closing openings in walls around pipes. Class C concrete shall be used for pipe cradle backfill, or as shown on the drawings. Class A concrete shall be used at all other locations.

B. Concrete shall be mixed and delivered in accordance with the requirements of "Standard Specifications for Ready-Mixed Concrete" (ASTM Designation C-94) and/or as modified by these specifications. During a continuous pour, the interval between loads shall not be greater than twenty minutes, or in any case be so

great as to allow the concrete in place to become partially hardened. Water used to flush the mixer or agitator between loads shall not be allowed to become a part of any concrete in the work.

C. When the ambient temperature is below 40°F, adequate equipment shall be provided for heating the component materials of the concrete so that the concrete being deposited can be maintained at a temperature of 50°F minimum to 90°F maximum. When the ambient air temperature is above 90°F, and adequate means of cooling the concrete mix shall be provided.

D. Truck mixers shall be revolving drum type and shall be equipped with a mixing water tank. Only the prescribed amount of mixing water shall be placed in the tank for any one batch, unless the tank is equipped with an approved device by which the amount of water added to each batch can be readily verified by the ENGINEER.

E. Delivery tickets shall be prepared for each load of ready-mixed concrete delivered. The batch plant operator shall prepare the ticket. The drivers of the trucks shall deliver the tickets to the OWNER's representative at the site at the time of the delivery. The tickets shall contain the following information:

1. Number of yards delivered on this truck
2. Quantities of materials in the batch
3. The time at which the truck left the batching plant
4. The time at which the cement was added
5. The outdoor temperature in the shade
6. The numerical sequence of the delivery
7. Date

F. Placing of the concrete shall be done in accordance with ACI Standard 304, "Recommended Practice for Measuring, Mixing and Placing Concrete", Except as modified or revised by these Specifications.

G. Before depositing concrete all debris shall be removed from the space to be occupied by the concrete. Forms, if constructed of lumber, shall be thoroughly secured in position. Water shall be removed from the space to be occupied by the concrete before concrete is

deposited.

H. Concrete shall be handled from the transporting vehicle in such a way as to prevent the separation or loss of the ingredients. Under no circumstances shall concrete that has partially hardened be deposited in the work. Concrete shall be deposited in the forms as nearly as practical in its final position to avoid rehandling. It shall be so deposited as to maintain, until the completion of the unit, a plastic surface approximately horizontal. Forms for walls or thin sections of considerable height shall be provided with openings or other devices that will prevent segregation and accumulation of hardened concrete on the forms or on the metal reinforcement above the level of the concrete.

I. Where concrete is conveyed to chutes, the equipment shall be of such size and design as to insure a continuous flow in the chute. The chutes shall be of metal, or metal-lined, and if two or more lengths are used, they shall have approximately the same slope. The slope shall not be less that one vertical to two horizontal and shall be such as to prevent the segregation of the ingredients. The discharge end of the chute shall be provided with a baffle plate to prevent segregation. If the distance of the discharge end of the chute above the surfaces of the concrete is more than three times the thickness of the layer being deposited, or more than 4 feet above the surface of the concrete, a spout or "elephant trunk" shall be used, and the lower end maintained as near to the surface of deposit as practical. When the operation is intermittent, the chute shall discharge into a hopper. The chute shall be thoroughly cleaned before and after each run and the debris from any water used shall be discharged outside the forms.

J. Before depositing new concrete on or against concrete which has hardened and to which it is to bond, the forms shall be retightened. The surface of the hardened concrete shall be roughened in a manner that will not leave loosened particles of aggregate to damaged concrete at the surface. It shall be thoroughly cleaned of foreign matter and laitance, and saturated with water. To insure an excess of mortar at the junction of the hardened and the newly deposited

concrete, the cleaned and saturated surfaces, including inclined surfaces, shall be first thoroughly covered with a coating of mortar or neat cement grout against which the new concrete shall be placed before the grout has attained its initial set.

K. Concrete during and immediately after depositing shall be thoroughly compacted by means of vibration. The number of vibrators used shall at all times be subject to the approval of the OWNER. The concrete shall be thoroughly worked around the reinforcement, and around embedded fixtures and into the corners of the forms. Attention is directed to the fact that manhole bottoms, pipe cradle and encasement and similar concrete work are required to be thoroughly vibrated.

L. The accumulation of water on the surface of the concrete due to water gain, segregation, or other causes, during placement and compacting, shall be prevented as far as possible by adjustment in the mixture. Provision shall be made for the removal of such accumulated water so that under no circumstances will concrete be placed in such accumulation.

M. To minimize the formation of laitance, great care shall be exercised to disturb the concrete as little as possible while it is being deposited. Upon completion of a section of concrete, all laitance shall be entirely removed before work is resumed. The CONTRACTOR shall submit to the OWNER, prior to start of work, the details of procedures he proposes to minimize and control the development of shrinkage cracks.

N. At least 24 hours must elapse after depositing concrete in the walls before depositing it in beams, girders, or slabs supported thereon. Beams and girders shall be considered as part of the floor system and shall be placed monolithically therewith.

O. Concrete shall be placed in cold weather in accordance with "Recommended Practice for Cold Weather Concreting" (ACI 306) except as modified or revised by these specifications. Before placing concrete during cold weather, the forms shall be free from frost and ice.

P. During those seasons of the year (after the first frost in the fall and until the daily mean temperature in the spring reaches 40°F for three successive days) when freezing temperatures can be anticipated, the CONTRACTOR shall maintain facilities to keep the concrete from freezing for at least 72 hours after placing.

Q. When the daily mean temperature drops below 40°F for more than one day, the concrete shall be maintained at a temperature of 55°F for Class B concrete and 50°F for Class A or Class C concrete for a minimum of five days. During this period concrete and adjacent form surfaces shall be kept moist at all times. When heated enclosures are to be provided, care shall be taken to provide adequate space around the outer edges and top of the concrete structure to permit circulation of the heated air so that neither freezing nor excessive heating of these extremities can occur. All facilities for protection and heating must be on hand before the concrete is placed.

R. After the required protection period is over, the heat shall be removed gradually and uniformly so that there will be a temperature differential of no more than 40°F over any 24 hour period.

S. Forms shall not be removed from the concrete surfaces during the protection period stipulated above, the forms shall not be removed for a period of three days during those seasons of the year previously specified when the difference between the daily high and low temperatures may reasonably be expected to exceed 40°F.

T. Concrete shall be placed in hot weather in accordance with "Recommended Practice for Hot Weather Concreting" (ACI 305) except as modified or revised by these specifications.

U. At air temperatures of 90°F or above, concrete should be kept as cool as possible during placing and curing. Concrete surfaces shall be wet cured in accordance with ACI 305 specifications for hot weather curing. After the period of wet-curing, a suitable heat-reflecting plastic membrane or white-pigmented curing compound may be used -- or immediate membrane curing.

V. If, after stripping of forms, any concrete is found to be not formed as shown on the Drawings, or is out of alignment or level, or shows a defective surface, it shall be considered as not conforming with the intent of these specifications and shall be removed and replaced by the CONTRACTOR at his expense unless the OWNER grants permission to patch the defective area, in which case patching shall be done as hereinafter described.

W. Defects that require replacement or repair are those that consist of honeycomb, damage due to stripping forms, loose pieces of concrete, surface holes caused by bolts and ties, excessive ridges at form joints and bulges due to movement of the forms. Ridges and bulges shall be removed by chipping, tooling or grinding on finished surfaces. Honeycomb and other defective concrete shall be chipped out, the chipped openings having sharp edges and shaped so that the mortar filling will be keyed in place. All holes shall be kept thoroughly moistened for several hours before mortar filling is placed.

X. Imperfections, bolt and tie-rod holes, and chipped-out honeycomb areas to be repaired shall be filled with dry patching mortar composed of one part of Portland Cement to two parts of regular concrete sand (volume measurement) and just enough water so that, after the ingredients are mixed thoroughly, the mortar will stick together on being molded into a ball by slight pressure of the hands, and will not exude free water. Mortar repairs shall be placed in thin layers and thoroughly compacted by suitable tools. Care shall be taken in filling rod and bolt holes so that the entire depth of the hole is completely filled with compacted mortar. "EMBECO", or equal, shall be added to all patching mortar in an amount as recommended by the manufacturer for the mix to be used except for unpainted, exposed surface.

End of Section

SECTION 03600

GROUT

PART 1: GENERAL

1.01 RELATED WORK

A. Cast-In-Place Concrete: Section 03300

1.02 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Grout manufacturer shall finish the Engineer with current independent laboratory test results indicating the grout as non-shrink from the time of placement; indicating no expansion after final set, ASTM C 827; indicating 4,000 psi strength developed with a trowelable mix within 24 hours, ASTM C 109; and indicating placement time based on initial set of not less than 60 minutes, ASTM C 191.

2. Test Results, as supplied by the grout manufacturer, shall indicate that in projects of similar scope and size, the effective bearing area was between 95 and 100 percent.

B. Laboratory Test of Grout: Perform test of sand/cement grout in accordance with ASTM C 1019.

1. Prior to placing grouts prepare trial batches of the proposed grout mixes for approval.

2. During production grout operation, perform grout test for each 5000 square feet of masonry.

1.03 REFERENCES

A. American Concrete Institute:

1. ACI 308, Recommended Practice for Curing Concrete

2. ACI 530, Specification for Masonry Structures.

B. American Society for Testing and Materials:

1. ASTM C 33, Specification for Concrete Aggregates

2. ASTM C 150, Specification for Portland Cement

3. ASTM C 191; Test Method for Time of Setting of Hydraulic Cement by Vicat Needle.

4. ASTM C 476; Specification for Grout for Reinforced and Non-Reinforced Masonry.

5. ASTM C 827; Test Method for Early Volume change of Cementitous Mixtures.

6. ASTM C 1019; Method for Sampling and Testing Grout.

1.04 DELIVERY, STORAGE AND HANDLING

A. Prevent moisture damage and contamination of materials.

B. Store materials in undamaged condition with seals and labels intact as packaged by the manufacturer.

1.05 PROJECT CONDITIONS

A. Protect against high and low temperatures and unfavorable environmental conditions in accordance with American Concrete Institute standards for placement of concrete.

PART 2: PRODUCTS

2.01 MATERIALS

A. Non-Shrink Non-Metallic Grout: A factory premixed material containing no corrosive irons, aluminum, chemicals, or gypsums and complying with the following limitations.

1. Grouts containing water reducers, accelerators, or fluidifiers shall have no drying shrinkage greater than the equivalent sand cement and water mix when tested according to ASTM C 596.

2. Grout shall exhibit no shrinkage before initial set and show no expansion after set when tested according to ASTM C 827.

3. Initial set of grout shall occur in not less than 60 minutes according to ASTM C 191 Test.

4. Use Type II (Sulfate Resistant) cement for grout applications in contact with sewage.

5. Acceptable Manufacturer: U.S. Grout Corporation, FIVE STAR, EMBCO, BASF Building Systems Master Flow 555 or equal.

B. Epoxy Based Grout: A moisture insensitive, solvent-free, high solids, high-modulus, and epoxy-resin grout formulated of epoxy component and selected silicia aggregate in a pre-proportion package. Grout properties as follows:

1. Compressive Strength, ASTM D 695: Minimum 12,000 psi in 28 days at 73 degree Fahrenheit ambient and material temperature.

2. Flexural Strength, ASTM D 790: Minimum 3,800 psi in 28 days at 73 degrees Fahrenheit ambient and material temperature.

3. Tensile, Shear Strength, ASTM D 638: Minimum 1,500 psi in 28 days at 73 degrees Fahrenheit ambient and material temperature.

4. Acceptable manufacturers:

   a. Sika Corporati9on; Sikadur Grout-Pak.
   b. L & M Construction Chemicals; EPOGROUT.
   c. The Euclid Chemical Company; Poly-Patch.
   d. Or Equal.

2.02 GROUT QUALITY

A. Non-Shrink Grout: Use ready-mix type requiring only the addition of water. Do not add other materials. Water requirement proportions shall conform to manufacturer's specification for desired mix consistency.

PART 3: EXECUTION

3.01 PREPARATION

A. Forming

1. Use forming procedures that allow proper and complete placement of grout.

2. Anchor Support elements so no movement is possible.

3. Remove supports only after grout has hardened.

4. Pre-treat wood forms with forming oils so that they do not absorb moisture.

B. Preparation of Surface:

1. General: A clean surface to be grouted to be free of oil, grease, laitance, dirt and other contaminates. Remove loose material. Remove rust, paint, and oil from metal components in contact with grout.

2. Non-shrink Grout: Perform additional surface preparation in accordance with manufacturer's instructions.

3.02 MIXING

A. Equipment: Use power operated mechanical mixer of sufficient capacity.

B. Time:

1. Non-Shrink Grout: In accordance with manufacturer's instructions.

2. Epoxy Base Grout: In accordance with manufacturer's instructions for preconditioning and two-component mixing.

3.03 PLACING

A. Epoxy Based Grout: Place in accordance with manufacturer's instructions.

B. Non-Shrink Non-Metallic Grout: Perform grout placement in accordance with the recommendations of ACI and the manufacturer's published specifications for mixing and placing. Place Non-Shrink Non-Metallic Grout only where indicated on Drawings.

End of Section

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DIVISION 9 - FINISHES

SECTION 09954

POLYETHYLENE ENCASEMENT

PART 1: GENERAL

1.01 DESCRIPTION

A. This section includes all materials, applications, labor and utilities of polyethylene sheet encasement.

B. All ductile iron pipe fittings installed on the pressure sewer under this contract shall be furnished with polyethylene encasement.

1.02 SUBMITTALS

A. Submit submittal packages in accordance with Section 01301.

B. Submit manufacturer's catalog literature and product data sheets describing the physical, chemical and electrical properties of the encasement material.

PART 2: PRODUCTS

2.01 POLYETHYLENE MATERIALS

A. The encasement shall consist of a polyethylene sheet or tube of at least 8 mils thickness conforming to AWWA C105.

2.02 PLASTIC ADHESIVE TAPE

A. Use 2 inch wide adhesive tape such as Calipco Vinly Tape. Polyken 900, Scotchwrap 50, or District approved equal.

PART 3: EXECUTION

3.01 APPLYING SHEET ENCASEMENT TO BURIED FITTINGS, COUPLINGS, AND APPURTENANCES

A. Wrap buried ferrous metal pipe fittings, couplings, adapters, and appurtenances with polyethylene sheet.

Overlap the adjoining pipe or fitting a minimum of one-foot and secure in place with 2-inch wide plastic adhesive tape. Apply a second layer and secure with tape around the barrel of the connecting pipe to prevent the entrance of soil. Pour concrete anchor and thrust blocks after the wrap has been properly placed.

B. Wrap base elbows and risers of hydrants and backflow prevention assemblies with 2 layers of polyethylene sheet and secure in place with 2-inch wide plastic adhesive tape. Extend the wrap to the finish ground level of the assembly. Secure the sheets with tape around the ends to prevent the entrance of soil. Pour concrete anchor and support blocks after the wrap has been properly placed.

C. Junctions between wrapped and unwrapped pipe - Where polyethylene wrapped pipe joins an ajdacent pipe that is not wrapped, extend the polethylene wrap to cover the adjacent pipe for a distance of at least 3 feet. Secure the end with circumferential turn of tape.

D. Backfill for polyethylene-wrapped pipe fittings - Use the same backfill material as that specified for pipe without polyethylene wrap, exerising care to prevent damage to the polyethylene wrapping when placing backfill. Backfill material shall be free from cinders, refuse, boulders, rocks, stones, or other material that could damage polyethylene.

E. The polyethylene encasement shall prevent contact between the pipe fittings and the surrounding backfill and bedding material but is not intended to be a comletely airtight or watertight enclosure. All clumps of clay, mud, cinders, and so forth, on the pipe surface shall be removed prior to installation of the polethylene encasement. During installation, care shall be exercised to prevent soil or embedment material from becoming trapped between the pipe fitting and the polyethylene.

F. The polyethylene film shall be fitted to the contour of the pipe to effect a snug, but not tight, encasement with minimum space between the polethylene and the pipe fitting. Sufficient slack shall be provided in contouring to prevent stretching the polyethylene where it bridges irregular surfaces, such

as bell-spigot interfaces, bolted joints, or fittings, and to prevent damage to the polyethylene due to backfilling operations. Overlaps and ends shall be secured with adhesive tape, plastic tie straps, or any other approved material capable of holding the polyethylene encasement in place until backfilling operations are complete.

G. For installations below the water table, the CONTRACTOR shall provide for circumferential wraps of the tape or plastic tie straps be placed at 2-ft (0.6-m) intervals along the barrel of the pipe to help minimize the space between the polyethylene and the pipe fitting.

3.02 REPAIR OF POLYETHYLENE MATERIAL

A. Repair polyethylene material that is damaged during construction. Use polyethylene sheet, place over damaged or torn area, and secure in place with 2-inch wide plastic adhesive tape.

End of Section

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ISSUED TO:

MUNICIPAL AUTHORITY OF THE
CITY OF MCKEESPORT
ALLEGHENY COUNTY, PA

BIDDING DOCUMENTS FOR CONTRACT NO. 2010-14

EAST SHORE SANITARY SEWER CONSTRUCTION

JANUARY 2011 RELEASE FOR BID

JULY 31, 2009
DEP SUBMITTAL

KLH
ENGINEERS, INC.
5173 Campbells Run Road
Pittsburgh, PA 15205
Telephone: (412) 494-0510
Fax: (412) 494-0426
E-mail: info@klhengineers.com
Ref. No. 220-35

ISSUED TO:

MUNICIPAL AUTHORITY OF THE
CITY OF MCKEESPORT
ALLEGHENY COUNTY, PA

BIDDING DOCUMENTS FOR CONTRACT NO. 2010-14

EAST SHORE SANITARY SEWER CONSTRUCTION

JANUARY 2011 RELEASE FOR BID

JULY 31, 2009
DEP SUBMITTAL

KLH
ENGINEERS, INC.
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Telephone: (412) 494-0510
Fax: (412) 494-0426
E-mail: info@klhengineers.com
Ref. No. 220-35

Municipal Authority of the City of McKeesport

East Shore Sanitary Sewer Construction

Contract No. 2010-14

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ADVERTISEMENT

CONTRACT NO. 2010-14

East Shore Sanitary Sewer Construction

Sealed bids for CONTRACT NO. 2010-14 East Shore Sanitary Sewer Construction project will be received by the Municipal Authority of the City of McKeesport, Allegheny County, Pennsylvania, at 100 Atlantic Avenue, McKeesport, PA 15132 until 11:00 A.M. prevailing time, February 24, 2011. Bids will be opened and read aloud at 1:00 P.M. at the McKeesport Palisades, 501 Water Street McKeesport, PA 15132.

A non mandatory Pre-bid meeting will be held on February 8, 2011 @ 10:00 A.M. at the McKeesport Palisades, 501 Water Street McKeesport, PA 15132.

Copies of the plans and specifications are on file for review at all Accu-Copy Reprographics locations.

Pittsburgh - North
108 Marshall Drive
Warrendale, PA 15086
Phone: 724-935-7055
Fax: 724-935-0250

Pittsburgh - Downtown
401 Wood St., Suite 202
Pittsburgh, PA 15222
Phone: 412-281-0799
Fax: 412-281-4463

Pittsburgh - East
616 - J Beatty Road
Monroeville, PA 15146
Phone: 412-457-0717
Fax: 412-457-0718

Copies of the bidding documents may be purchased at these locations or online www.accu-copy.com at a non-refundable cost of $100.00 per set.

A certified check, bank draft, or a Bid Bond executed on the prescribed form by the Bidder and a Surety Company, in the amount equal to ten percent (10%) of the Bid, shall be submitted with each Bid to guarantee the Bidder's entrance into this Contract if given the award. No Bid Bond shall be waived or returned because the Bidder failed to or cannot comply with any requirements set forth in the

Bidding Documents or any applicable statutes of the United States, the Commonwealth of Pennsylvania and/or all local ordinances.

No Bid may be withdrawn for a period of ninety (90) days after the time of the opening of the bids.

The Contractor must insure that employees and applicants for employment are not discriminated against because of their race, creed, color or national origin.

Contractor must comply with the Prevailing Wage Rate set forth by the Pennsylvania Department of Labor and Industry. Materials utilized must comply with the Steel Products Procurement Act.

The Municipal Authority reserves the right to reject any or all Bids and to waive any informality therein.

Joseph Rost
Executive Director

Section B

INSTRUCTIONS TO BIDDERS

B1 Designation of Work

The work included under this contract covers the furnishing of all labor, materials, tools and equipment required to complete the work as described herein, shown on the Contract Drawings and necessary for complete operating facilities.

The work under Contract No. 2010-14 covers the furnishing of all labor, material, plant, utilities required for the construction of sanitary sewage inceptor sewers and sanitary sewage pressure sewers (forcemains) and appurtenances east of the Youghiogheny River. The project is located in the City of McKeesport, Allegheny County. Included in this work is construction of the 16 inch diameter Ripple Road Pressure Sewer which begins at the Authority's proposed Ripple Road Pump Station, constructed by others under a separate contract and, located at the intersection of Ripple Road at Long Run Road, S.R. 0048. The pressure sewer construction extends along Long Run Creek, Long Run Road, S.R. 0048, Old Long Run Road and across Walnut Street where it connects into a new 30 inch diameter interceptor sewer. The new interceptor sewer will extend to and terminate at the Municipal Authority's Long Run Pump Station located at the intersection of Will Street at Walnut Street. Also included in this project is construction of a portion of the 20 inch diameter Long Run Pressure Sewer between the Long Run Pump Station and the east shore of the Youghiogheny River. In addition, this Contract includes demolition of certain sanitary sewage structures and interceptor sewer mains with reconnection of service sewers along the interceptor sewer construction.

B2 Location of Construction Work

All construction work is proposed to be performed in the City of McKeesport.

B3 Copies of Bidding Documents

Copies of the Bidding Documents for the described work may be obtained from Accu-Copy Reprographics at the address shown on the Advertisement. The non-refundable price for same is also stated in the Advertisement.

Complete sets of Bidding Documents shall be used in preparing Bids; neither OWNER nor ENGINEER assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

OWNER and ENGINEER in making copies of Bidding Documents available on the above terms do so only for the purpose of obtaining Bids on the Work and do not confer a license or grant for any other use.

B4 Qualifications of Bidders

To demonstrate qualifications to perform the Work, each Bidder must be prepared to submit, within five days of OWNER's request, written information such as financial data, previous experience and evidence of authority to conduct business in the jurisdiction where the Project is located.

B5 Examination of Contract Documents and Site

Before submitting a Bid, each Bidder shall: (a) examine the Bidding/Contract Documents thoroughly, (b) visit the site to familiarize himself with local conditions that may in any manner affect access, cost, progress or performance of the work, (c) familiarize himself with federal, state and local laws, ordinances, rules and regulations that may in any manner affect access, cost, progress or performance of the Work; and (d) study and carefully correlate Bidder's observations with the Contract Documents.

Before submitting his Bid, each Bidder shall, at his own expense, make such investigations and tests as the Bidder may deem necessary to determine his Bid for performance of the Work in accordance with the time, price and other terms and conditions of the Contract Documents.

On request, OWNER may assist each Bidder who desires access to the site to conduct such investigations and tests as each Bidder deems necessary for submission of his Bid.

B6 Interpretations, Clarifications and Requests for Information

All questions, clarifications and/or Requests for Information about the meaning or intent of the Contract Documents shall be submitted to ENGINEER in writing via letter, fax, or e-mail at macmproject@klhengineers.com. Replies will be issued by Addenda mailed or delivered to all parties recorded as having received

the Bidding Documents. Only interpretations written by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

B7 Bid Security

Bid Security shall be made payable to OWNER, in an amount of not less than ten percent (10%) of the Bidder's maximum Bid price in the form of either a certified bank check or a Bid Bond on the form attached in Section D, issued by a Surety meeting the requirements set forth at the bottom thereof.

The Bid Security of the Successful Bidder will be retained until such Bidder has executed the Agreement and furnished the Required Contract Security, whereupon it will be returned; if the successful Bidder fails to execute and deliver the Agreement and furnish the required Contract Security within 15 days of Notice of Award, OWNER may annul said Notice and the Bid Security of that Bidder will be forfeited. The Bid Security of any Bidder whom OWNER believes to have a reasonable consideration for receiving the award may be retained by OWNER until after the effective date of the Agreement.

B8 Contract Time

The number of calendar days within which, or the date by which, the Work is to be completed (the Contract Time) is set forth in the Bid Form and will be included in the Agreement.

B9 Liquidated Damages

Provisions for liquidated damages are set forth in the Agreement.

B10 Bid Forms

The Bid Forms are attached hereto; additional copies may be obtained from ENGINEER.

Bid Forms must be completed in ink or by typewriter. The total Bid price on the form must be stated in words and numerals; in case of a conflict, words will take precedence.

Bids by Corporations must be executed in the corporate name by the president or a vice-president (or other corporate officer accompanied by evidence of authority to sign) and the corporate seal must be affixed and attested by the secretary or an assistant secretary. The corporate address shall be shown below the signature.

Bids by Partnerships must be executed in the partnership name and signed by a partner, whose title must appear under the signature and the official address of the partnership must be shown below the signature.

All names must be typed or printed below the signature.

The Bids shall contain an acknowledgment of receipt of all Addenda (the numbers of which shall be filled in on the Bid Form by the Bidder).

The address to which communications regarding the Bid are to be directed must be shown.

B11 Submission of Bids

Bids shall be submitted at the time and place indicated in the Advertisement and in a sealed envelope, marked with the Project contract and title, the name and address of the Bidder and accompanied by the Bid Security and other required documents. If the Bid is sent by U. S. Mail or other delivery system, the sealed envelope shall be enclosed in a separate envelope with the notation "BID ENCLOSED" on the face thereof. All bids must be received by the OWNER at or prior to the time indicated in the Advertisement.

Bids received prior to the advertised hour of opening will be securely kept sealed. The officer whose duty it is to open them will decide when the specified time has arrived, and no Bid received thereafter will be considered; except that when a Bid arrives by mail after the time fixed for opening, but before the reading of all other bids is completed, and it is shown to the satisfaction of the OWNER that the non-arrival on time was due solely to delay in the U.S. mail or other delivery system utilized for which the Bidder was not responsible, such Bid will be received and considered. Unless specifically authorized, facsimile transmissions or telegraphic bids will not be considered.

B12 Modification and Withdrawal of Bids

Bids may be modified or withdrawn by an appropriate document duly executed (in the manner that a Bid must be executed) and delivered to the place where Bids are to be submitted at any time prior to the opening of Bids.

B13 Award of Contract

OWNER reserves the right to reject any and all Bids for whatsoever cause and to waive any and all informalities in the Bid. Discrepancies between words and figures will be resolved in favor of words. Discrepancies between the indicated sum and/or the products shown as a result of extending unit prices and the correct sum and/or products thereof will be resolved in favor of the correct sum and/or products.

In evaluating Bids, OWNER shall consider the qualifications of the Bidders, whether or not the Bids comply with the prescribed requirements and alternates and unit prices (if requested) in the Bid forms.

OWNER may conduct such investigations as he deems necessary to assist in the evaluation of any Bid and to establish the responsibility, qualifications and financial ability of any or all Bidders.

If the contract is to be awarded, it will be awarded on the Base Bid or Alternate Bid Items selected by the OWNER which are those of the lowest responsive and responsible Bidder whose evaluation by OWNER indicates to OWNER that the award will be in the best interests of the Project.

B14 Performance and Other Bonds

The General Conditions and/or the Supplemental General Conditions set forth OWNER's requirements as to Performance and other Bonds. When the Successful Bidder delivers the executed Agreement to OWNER it shall be accompanied by the required Contract Security.

B15 Signing of Agreement

When OWNER advises of a Contract Award to the Successful Bidder, it will be accompanied by at least five unsigned counterparts of the Agreement and all other Contract Documents. Within fifteen (15) days thereafter, CONTRACTOR shall sign and deliver all counterparts of the Agreement to OWNER with all other Contract Documents attached. Within ten (10) days thereafter OWNER will deliver two fully signed counterparts to CONTRACTOR -- one each intended for the CONTRACTOR and the CONTRACTOR's Surety Company. The times set forth herein are of the essence and Bidder's failure to comply herewith may, at the discretion of the OWNER, result in forfeiture of the Bid Security.

B16 Existing Utilities, Structures, Materials and Subsurface Conditions

CONTRACTOR is directed to the provisions of the Underground Utility Line Protection Law Act 287 (1974), as amended by Act 181 December 2006, and full compliance therewith is required of the CONTRACTOR.

Certain information regarding the reputed presence, size, character and location of existing underground structures and public utilities such as pipes, drains, sewers, electrical lines, telephone lines, cable TV lines, gas lines, water lines, materials and/or subsurface conditions, has been shown on the Contract Drawings.

Neither the OWNER nor the ENGINEER makes any warranty or representation that the information obtained through the Pennsylvania One-Call system is accurate and the CONTRACTOR assumes all risks that the underground structures, utilities, materials and/or subsurface conditions, as shown, may be encountered. To this end the CONTRACTOR shall perform due diligence in determining the actual location of the reputed facilities as required by Act 287 as amended.

The CONTRACTOR hereby distinctly agrees that neither the OWNER nor the ENGINEER is responsible for the correctness or sufficiency of any such information given, that this information is not to be considered a part of the Contract, that the CONTRACTOR shall make no claim for delay or extra compensation or damage against the OWNER or the ENGINEER on account of incorrectness of information given, or on account of the insufficiency or absence of information regarding structures, private utilities to and from occupied structures including but not limited to: water, sanitary sewer, gas, electric, telephone, cable, service laterals; roof and/or foundation drains; and materials and/or subsurface condition either revealed or not revealed by the Drawings and that he shall have no claim for relief from any obligation or responsibility under the Contract, in case the location, size, or character of any structure, private utilities to and from occupied structures including but not limited to: water, sanitary sewer, gas, electric, telephone, cable, service laterals; roof and/or foundation drains; and , materials and/or subsurface conditions, is not as indicated on the Drawings, or in case any structure, private utilities to and from occupied structures including but not limited to: water, sanitary sewer, gas, electric, telephone, cable, service laterals; roof and/or foundation drains; and materials and/or subsurface conditions, not shown on the Drawings is encountered.

The CONTRACTOR shall be responsible for and bear all costs of protecting all structures and utilities, both above the ground and below the ground, within and outside the right-of-way, and all costs of any required relocation of any structures or utilities and shall repair any damage to any structure or utility to the satisfaction of the owner thereof at no additional expense to the OWNER.

The CONTRACTOR shall have the responsibility to determine the location of all structures and utilities, above and below the surface of the ground, the character of the subsurface material and the conditions to be encountered overhead, on the surface, and underground, before submitting his bid.

The CONTRACTOR shall have the responsibility of providing special means to brace and hold the utility lines, the telephone poles and the electrical power poles in place during the construction, and to reinforce and protect same from future displacement, disturbance or damage attributable to settlement of backfill or surface water erosion of restored areas.

B17 Buy American

In accordance with federal regulations and guidelines the CONTRACTOR agrees that preference will be given to domestic construction materials by the CONTRACTOR, subcontractors, materials and suppliers in the performance of this contract. The requirements of the "Steel Products Procurement Act" shall supersede the "Buy American" requirements.

B18 Pennsylvania Sales and Use Tax

Materials and equipment utilized under the contract may or may not be exempt from Pennsylvania sales tax. The CONTRACTOR shall make their own determination as to which, if any, of the materials and equipment utilized under the contract are exempt from sales tax. Beyond issuing a blanket sales tax exemption form, the OWNER and/or ENGINEER will provide no further assistance in this determination. Failure of the CONTRACTOR to make this determination will not be grounds for additional compensation under the contract.

B19 Steel Products

Each CONTRACTOR, equipment and material supplier on these contracts is notified that materials utilized under these contracts must comply with the provisions of the Act of March 3, 1978 (P.L.G. No. 3) Known as the "Steel Products Procurement Act". The CONTRACTOR is required to submit Form SP (provided as the last page of Section B) with each initial shop drawing submittal as applicable.

All iron, steel and manufactured goods used in this project shall be produced in the United States unless the designated official of the United States Environmental Protection Agency finds that:

i. The application of this section would be inconsistent with the public interest;

ii. Iron, steel and the relevant manufactured goods are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or

iii. The inclusion of iron, steel or manufactured goods produced in the United States will increase the overall value of the project by more than twenty-five percent (25%).

B20 Construction Combination Bids

It is recognized that the OWNER may realize some savings in the total cost of construction by awarding multiple construction contracts to the same Bidder. In view of that prospect, a Combination Bid will be acceptable providing it is submitted on the proper Combination Bid Form included in Section C of the Contract Document identified herein below.

Bidders desiring to submit a Combination Bid and holding plans for Contract documents identified in the combinations offered are hereby invited to submit a combination bid and thereby offer the OWNER a corresponding reduction in the total cost of construction, will be required to submit a bid for each Contract within the combination, independently, on the respective Contract Bid Forms provided in Section C of the respective contract specifications identified below. The contract price percentage reduction in the amount bid and the reduction monetary value for the work under each contract, if awarded the Combination, shall then be inserted in the spaces provided in the Combination Bid Form in this document.

CONTRACTOR's bidding combination work of multiple Contracts shall provide a Bid Bond that identifies all Contracts being bid inclusive of all Contracts within the combination.

The combination contract price percentage reduction shall be applied to the respective contract bid items unit price to determine the combination bid items unit prices for award of combination contracts.

The Bid Form found in Section C of Contract 2010-01/02 Wastewater Treatment Plant Expansion (WWTP) contains the following bid combinations.

WWTP Combination No. 1

- Contract 2010-01 Wastewater Treatment Plant Expansion General Mechanical Construction.
- Contract 2010-02 Wastewater Treatment Plant Expansion Electrical Construction.

WWTP Combination No. 2

- Contract 2010-01 Wastewater Treatment Plant Expansion General Mechanical Construction.
- Contract 2010-03 West Shore Pump Station General Mechanical Construction.
- Contract 2010-05 Long Run Pump Station Improvements General Mechanical Construction.
- Contract 2010-07 Ripple Road Pump Station General Mechanical Construction.
- Contract 2010-09 28th Avenue Pump Station Improvements General Mechanical Construction.
- Contract 2010-11 Cliff Street Pump Station Improvements General Mechanical Construction.

WWTP Combination No. 3

- Contract 2010-02 Wastewater Treatment Plant Expansion Electrical Construction.
- Contract 2010-04 West Shore Pump Station Electrical Construction.
- Contract 2010-06 Long Run Pump Station Improvements Electrical Construction.
- Contract 2010-08 Ripple Road Pump Station Electrical Construction.
- Contract 2010-10 28th Avenue Pump Station Improvements Electrical Construction.

- Contract 2010-12 Cliff Street Pump Station Improvements Electrical Construction.

WWTP Combination No. 4

- Contract 2010-01 Wastewater Treatment Plant Expansion General Mechanical Construction.
- Contract 2010-02 Wastewater Treatment Plant Expansion Electrical Construction.
- Contract 2010-03 West Shore Pump Station General Mechanical Construction.
- Contract 2010-04 West Shore Pump Station Electrical Construction.
- Contract 2010-05 Long Run Pump Station Improvements General Mechanical Construction.
- Contract 2010-06 Long Run Pump Station Improvements Electrical Construction.
- Contract 2010-07 Ripple Road Pump Station General Mechanical Construction.
- Contract 2010-08 Ripple Road Pump Station Electrical Construction.
- Contract 2010-09 28th Avenue Pump Station Improvements General Mechanical Construction.
- Contract 2010-10 28th Avenue Pump Station Improvements Electrical Construction.
- Contract 2010-11 Cliff Street Pump Station Improvements General Mechanical Construction.
- Contract 2010-12 Cliff Street Pump Station Improvements Electrical Construction.
- Contract 2010-13 West Shore Sanitary Sewer Construction.
- Contract 2010-14 East Shore Sanitary Sewer Construction.
- Contract 2010-15 Youghiogheny River Forcemain Crossing

The Bid Form found in Section C of Contract 2010-03/04 West Shore Pump Station Construction contains the following bid combinations.

Pump Station Combination No. 1

- Contract 2010-03 West Shore Pump Station General Mechanical Construction.
- Contract 2010-05 Long Run Pump Station Improvements General Mechanical Construction.
- Contract 2010-07 Ripple Road Pump Station General Mechanical Construction.

- Contract 2010-09 28th Avenue Pump Station Improvements General Mechanical Construction.
- Contract 2010-11 Cliff Street Pump Station Improvements General Mechanical Construction.

Pump Station Combination No. 2

- Contract 2010-04 West Shore Pump Station Electrical Construction.
- Contract 2010-06 Long Run Pump Station Improvements Electrical Construction.
- Contract 2010-08 Ripple Road Pump Station Electrical Construction.
- Contract 2010-10 28th Avenue Pump Station Improvements Electrical Construction.
- Contract 2010-12 Cliff Street Pump Station Improvements Electrical Construction.

Pump Station Combination No. 3

- Contract 2010-03 West Shore Pump Station General Mechanical Construction.
- Contract 2010-04 West Shore Pump Station Electrical Construction.
- Contract 2010-05 Long Run Pump Station Improvements General Mechanical Construction.
- Contract 2010-06 Long Run Pump Station Improvements Electrical Construction.
- Contract 2010-07 Ripple Road Pump Station General Mechanical Construction.
- Contract 2010-08 Ripple Road Pump Station Electrical Construction.
- Contract 2010-09 28th Avenue Pump Station Improvements General Mechanical Construction.
- Contract 2010-10 28th Avenue Pump Station Improvements Electrical Construction.
- Contract 2010-11 Cliff Street Pump Station Improvements General Mechanical Construction.
- Contract 2010-12 Cliff Street Pump Station Improvements Electrical Construction.

The Bid Form found in Section C of Contract 2010-13 West Shore Sanitary Sewer Construction contains the following bid combination.

Sewer Combination

- Contract 2010-13 West Shore Sanitary Sewer Construction.
- Contract 2010-14 East Shore Sanitary Sewer Construction.
- Contract 2010-15 Youghiogheny River Forcemain Crossing

B21 Limited Bonding

Prospective Bidders interested in bidding all of that work but desire to limit the dollar-amount of the contracts which would actually be awarded to their respective companies shall proceed as follows:

a. Submit as security with your bids, a single Bid Bond (or Certified bank check) on which it clearly indicates the Contracts, by number, which you are interested in constructing and which are covered by the said surety.

b. Indicate, on the face of the Bid Bond, an actual dollar amount of bid security - which amount will be construed to represent 10% of the maximum value of the work which you are willing and/or capable of performing. (In other words, if the bidder wishes to maximize his opportunity to be competitive but is limited to performance of, say $10,000,000 total value of construction work, he may bid each of Contract 2010-13 West Shore Sanitary Sewer Construction, Contract 2010-14 East Shore Sanitary Sewer Construction and Contract 2010-15 Youghiogheny River Forcemain Crossing, and simply indicate that the amount of bid security is $1,000,000). It shall be understood that the OWNER reserves the right to select which of the contracts will be awarded to those who avail themselves of this opportunity; and, that the amount of the bid security may not be increased or decreased after bids have been officially received, opened, and read aloud. It is also understood that if the Principal (contractor) and Surety fail to perform all of the conditions of the Bond that the net sum to be paid as liquidated damages, shall be in the amount of only 10% of the amount bid for construction of the work which the OWNER desires to award the Bidder. The OWNER will evaluate all of the Bids and will, at the apparent least cost of construction, award the work to those responsive and responsible bidders from whom the amounts bid aggregate said least cost.

End of Section B

Instructions to Bidders

FORM SP

This form must be executed by a Fabricator of any item containing BOTH FOREIGN AND U.S. MANUFACTURED STEEL. The Steel Products Procurement Act (73 P.S. S1991 et seq.) allows the use of steel products with both types of steel if seventy-five (75%) percent of the cost of the materials (including steel, rubber, wood, plastic, etc.) in the product are manufactured or produced, as the case may be, in the United States.

The Fabricator shall be herein defined as the firm that assembles the component parts of the item(s) to be purchased. The OWNER will accept the certification of firms that are earlier in the chain of purchase (i.e. manufacturers of components, steel, suppliers) in lieu of the Fabricator. This form must be submitted to the ENGINEER with the initial shop drawing submission and before the product may be incorporated as provided above.

TO BE COMPLETED BY THE FABRICATOR:

1. Contract No. _____ Contract Title: _____

2. Specification Paragraph No. _____ Specification Page: _____

3. Product: _____

4. Name of Supplier: _____

5. Address of Supplier: _____

6. Federal Employer I.D. No.: _____ Phone No. : (___) _____

7. Total cost of materials in the item listed in Item 3 that were manufactured/produced in the United States is greater than 75% of total cost of all materials.

   _____YES _____NO

CERTIFICATION: I, the undersigned Officer of the above named firm, do certify that our firm assembled/manufactured the components to the steel products listed in Item 3, that the steel in said product is both foreign and domestically manufactured and that all the facts contained in this document are true. I further understand that this document is subject to the provisions of the Unsworn Falsification to Authorities Act (18 P.S. S4904) which provide penalties including, but not limited to, debarment from supplying and products for Commonwealth of Pennsylvania public works projects for a period of five (5) years for violations therein.

WITNESS:

_____ _____(SEAL)

Secretary or Treasure — President or Vice President

(Corporate Seal) — (Fabricator's Company)

Date: _____

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Section D

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we _____
_____
as Principal and _____
of _____, State of _____,
a corporation existing under the laws and the State of _____
_____, and authorized to transact business in
_____, as Surety, are held and firmly bound unto
_____
(OWNER)
_____
(Address)
hereinafter called the Obligee, in the sum of _____
_____Dollars ($_____).
lawful money of the United States of America, for payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has submitted the accompanying Proposal or Bid dated _____, 20___, for the _____
_____.

NOW THEREFORE, the condition of this Bond shall be such that if the Principal, upon due acceptance of said Proposal and award of the Contract to him by the Obligee, bonds with good and sufficient surety as may be required by the Contract Documents, and furnishes the Obligee proper evidence of effectiveness of insurance coverage, respectively, within the time, in the forms and in the amounts as appropriate, required by the Contract Documents, and enters into a Contract with the Obligee in accordance with the Contract Documents, then this Bond shall be void; otherwise, the Bond shall be and shall remain in full force and effect.

The Principal and Surety hereby stipulate and agree that if the Principal fails to perform all conditions of this Bond, they will pay the sum of the Bond to the Obligee as fixed, liquidated damages.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its Bond shall be in no way impaired or affected by any extension of time within which the OWNER may accept such bid; and said Surety does hereby waive notice of any extension.

It is the intention of the parties to be legally bound by this instrument.

IN WITNESS WHEREOF, the above bounded parties have executed this instrument under their several seals this ____ day of _____, 20___, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned and representative, pursuant to authority of its governing body.

ATTEST: DATE _____, 20_____

WITNESS:

_____
Name of Bidder, Corporation, Firm or Individual

_____ By_____

_____
(Title)

_____

_____
Business Address of Bidder

****

ATTEST:

_____ _____

_____
Surety

_____
Attorney-in-Fact

IMPORTANT - Surety companies executing Bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the project is located.

Section E

GENERAL CONDITIONS

E1 Definitions

Wherever used in these General Conditions or in the other Contract Documents, the following terms have the meanings indicated which are applicable to both the singular and plural thereof:

Addenda
Written or graphic instruments issued prior to the opening of bids which clarify, correct or change the bidding documents or the Contract Documents and which will be included as Section L of the Contract Documents for award and construction.

Advertisement
The legally published and/or distributed notification to prospective Bidders and others of the Project and the OWNER's intent to receive bids on same. The Advertisement is included as Section A of these documents.

Agreement
The written agreement between OWNER and CONTRACTOR covering the Work to be performed; other Contract Documents are attached to the Agreement and made a part thereof as provided therein. The Agreement is included as Section J of the Bidding/Contract Documents.

Application for Payment
The form accepted by ENGINEER which is to be used by CONTRACTOR in requesting progress or final payments and which is to include such supporting documentation as is required by the Contract Documents, Section H.

Bid
The offer or proposal of the bidder submitted on the prescribed Bid Form setting forth the prices for the Work to be performed. Bid Forms are Section C of these documents.

Bonds
Bid, performance, payment, labor and materialsmen, maintenance and special bonds and other instruments of security. The Bid Bond form is Section D; other Surety Bond forms are Section K of these documents.

Change Order
A document signed by CONTRACTOR and OWNER which authorizes an addition, deletion or revision in the Work, or an adjustment in the Contract Price or the Contract Time, issued on or after the Effective Date of the Agreement.

Contract Documents
The Advertisement, Instructions to Bidders, Bid Form, Bid Bond, General Conditions, Supplemental General Conditions, Technical Specifications, Measurement and Payment, Agreement, Bonds, Addenda and Drawings together with all modifications and supplements issued as Change Orders on or after the Effective Date of the Agreement.

Contract Price
The moneys payable by OWNER to CONTRACTOR under the Contract Documents as stated in the Agreement.

Contract Time
The number of calendar days stated in the Bid Form and in the Agreement for the completion of the Work.

CONTRACTOR
The person(s), firm(s) or corporation(s) with whom OWNER has entered into the Agreement.

Drawings
The drawings, plans, details, supplemental details, graphics, diagrams, photo reproductions and other representations which show the character and scope of the Work to be performed and which have been prepared or approved by ENGINEER and/or the OWNER.

Effective Date of the Agreement
The date indicated in the Agreement on which it becomes effective, but if no such date is indicated it means the date on which the Agreement is signed and delivered by the last of the parties to sign and deliver.

ENGINEER
KLH Engineers, Inc.

General Conditions
Terms pertaining to the Contract and the performance of the Work thereunder that are of frequent and continuing applicability. The General Conditions are included as Section E of these documents.

Laws and Regulations
Laws, rules, regulations, ordinances, codes appertaining to the conduct of and/or location of the work.

Insurance
Protection provided to the parties to the Contract as required by the General Conditions and the Supplemental General Conditions and evidenced by either insurance policies or certificates of insurance coverages. Form of certificate and coverages is included under Section K.

Measurement and Payment
The conditions under which payments are to be determined and made to the CONTRACTOR for Work performed under the Contract or as an addition to or deduction from the Contract. The Measurement and Payment provisions are included as Section H.

Notice of Award
The written notice by the OWNER or ENGINEER to the apparent Successful Bidder stating that the Contract has been awarded to it.

Notice to Proceed
A written notice given by the OWNER or ENGINEER to CONTRACTOR fixing the date on which the Contract Time will commence. When such Notice to Proceed is not issued, the Contract Time will commence on the date appearing in the Agreement (Section J).

OWNER
The private or public agency with whom CONTRACTOR has entered into the Agreement and for whom the Work is to be provided.

Partial Utilization
Placing a portion of the Work in service for the purpose for which it is intended (or a related purpose) before reaching Substantial Completion for all the Work.

Project
The total construction of which the Work to be provided under the Contract Documents may be the whole, or a part as indicated elsewhere in the Contract Documents.

Resident Project Representative
The authorized representative of the ENGINEER or the OWNER who is assigned to the site or any part thereof, for the purpose of monitoring the construction of the work under this contract.

Shop Drawings
All drawings, diagrams, illustrations, schedules, catalog information and other data which are specifically prepared by or for CONTRACTOR to illustrate some portion of the Work and which are submitted by CONTRACTOR for review and/or approval for incorporation in the Work.

Technical Specifications
Those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work and certain administrative details applicable thereto. They are Section G of these documents.

Subcontractor
An individual, firm or corporation having a direct contract with CONTRACTOR or with any other Subcontractor for the performance of a part of the Work at the site.

Substantial Completion
The Work (or a specified part thereof) which has progressed to the point where, in the opinion of the OWNER and/or ENGINEER, it is sufficiently complete, in accordance with the Contract Documents, so that the WORK (or specified part) can be utilized for the purposes for which it is intended.

Supplemental Details
Certain drawings, plans, details, characteristic curves, graphics, diagrams, photo reproductions, tabular data or other representation respective to the Work and which are bound in the rear of the Bidding/Contract Documents Book as Section I.

Supplemental General Conditions
The part of the Contract Documents which amends or supplements these General Conditions (if any). They are Section F of these documents.

Supplier
A manufacturer, fabricator, supplier, distributor, materialman or vendor.

Unit Price Work
Work to be paid for on the basis of unit prices.

Work
The entire construction or the various separately identifiable parts thereof required to be furnished under the Contract

Documents. Work is the result of performing services, furnishing labor and furnishing and incorporating materials and equipment into the construction, all as required by the Contract Documents.

E2 Preliminary Matters

E2.1 Delivery of Bonds
When CONTRACTOR delivers the executed Agreements to OWNER, CONTRACTOR shall also deliver to OWNER such Bonds as CONTRACTOR may be required to furnish in accordance with the Contract Documents. The Surety Bond forms are attached as Section K of these documents.

E2.2 Copies of Documents
OWNER shall furnish to CONTRACTOR two copies of the Contract Documents for the execution of the Work. Additional copies will be furnished, upon request, at the cost of reproduction.

E2.3 Commencement of Contract Time; Notice to Proceed
The Contract Time will commence on the effective date of the Agreement or, if a Notice to Proceed is given, on the date indicated in the Notice to Proceed. A Notice to Proceed may follow contract award by OWNER by no more than 45 days, unless otherwise specifically noted within Section B, Instructions to Bidders.

E2.4 Starting the Project
CONTRACTOR may start to perform the Work on the date when the Contract Time commences, but no Work shall be done at the site prior to the date on which the Contract Time commences. If scheduled by the Engineer, the CONTRACTOR will be required to attend a pre-construction meeting.

Within ten days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), CONTRACTOR shall submit to OWNER or his designee, for review:

- a proposed progress schedule indicating the starting and completion dates of the various stages of the work;

- a schedule of values for all of the Work. This will include quantities and prices of items aggregating the Contract Price and will subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during construction.