SPECIFICATIONS FOR THE CONSTRUCTION OF SANITARY SEWER LINES AND APPURTENANCES

JUNE 2016

MOON TOWNSHIP MUNICIPAL AUTHORITY

ALLEGHENY COUNTY, PENNSYLVANIA

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MOON TOWNSHIP MUNICIPAL AUTHORITY
SEWER USE RULES AND REGULATIONS

SPECIFICATIONS FOR THE CONSTRUCTION OF SANITARY SEWER LINES AND APPURTENANCES

TABLE OF CONTENTS

DIVISION 3 -CONCRETE

DIVISION 11 – PUMPS

APPENDICES

SECTION 01000

SCOPE

DIVISION I – GENERAL REQUIREMENTS

PART 1: GENERAL

1.01 These specifications cover the requirements for construction of all of the Authority's sewer line facilities. These specifications are intended for and apply to all such projects whether directly constructed by CONTRACTOR(S) under contract to the AUTHORITY, or constructed by a land developer who in turn employs construction CONTRACTOR(S).

1.02 These specifications are to be used in conjunction with a companion document – “Sewer Use Rules and Regulations”.

1.03 The Rules and Regulations describe and identify procedural requirements, relative to engineering work, payment of fees, certain facility design criteria and parameters, private sewer service facility requirements, time restraints, certain terms which will be incorporated in an agreement with the AUTHORITY before the commencement of construction and other factors relating to the sewage system facilities desired to be constructed in connection with the development of the Township.

1.04 This document covers the construction work.

1.05 Where the term "AUTHORITY" is used herein, it shall mean the MOON TOWNSHIP MUNICIPAL AUTHORITY, its employees, management, or Board, as is appropriate for each occurrence of use of the term. When necessary or appropriate the AUTHORITY may call upon its engineering and/or legal consultants for advice and direction.

PART 2: PRODUCTS

Not Used.

PART 3: EXECUTION

3.01 GENERAL REQUIREMENTS OF CONSTRUCTION

A. All plans shall include the imprint of a seal and signature of a professional engineer currently registered in the Commonwealth of Pennsylvania.

B. Ductile iron push-on joint pipe with Field-Lok gaskets shall be installed in all fill areas, across streams, and

on steep slopes, 20% or greater. In addition to restrained joints, concrete anchors shall be installed on sewers with slopes exceeding 20%. The ductile iron pipe shall be polywrapped if acidic soils are encountered unless concrete encasement is installed.

C. SDR 26 PVC pipe shall be used in every instance in which the cover depth exceeds 15 feet. Maximum cover shall not exceed 30 feet.

D. Vertical separation of a minimum of 1.5 feet shall be maintained at all utility crossings.

E. Minimum cover over the sanitary sewer shall be 5 feet in roads, drives, and traveled areas and 4 feet in yards.

F. Splash connections shall be required at the intersections with existing lines to avoid problems arising from disagreement in invert elevations. Splash connections shall also be required at abrupt changes in grade. An abrupt change shall be considered a difference of 10 percent or greater in the slopes of the incoming and outgoing lines.

G. All connections to existing manholes shall be core-drilled and a boot or link seal collar installed around the new pipe to prevent infiltration. The manhole invert shall be reshaped for the new flow pattern.

H. Manholes shall be at least 5 and, preferably, 6 feet deep to permit entry for maintenance.

I. Manholes greater than 20 feet deep shall be a minimum 5 feet in diameter and ventilated.

J. Special consideration shall be given during landscaping to maintain the minimum cover over the sewers and to keep the manhole lids visible.

K. The AUTHORITY shall be provided with accurate as-built locations of the sanitary sewers along with recorded easements at the conclusion of construction. The minimum sanitary sewer easement is 20 feet in width, centered on the sewer. Easements for parallel storm and sanitary sewers shall be a minimum 30 feet in width.

L. A minimum slope of two percent shall be provided at the end of lines.

M. Shop drawings for pipe, as submitted, shall hold true throughout construction. The AUTHORITY will not accept more than one manufacturers pipe in each phase of development. Piping for laterals and mains shall be provided by the same manufacturer. Only materials submitted per the first approved set of shop drawings will be accepted throughout the job.

N. Manholes installed in wooded areas or where indicated on the drawings shall be extended 12-inches above grade minimum and frames and covers shall be security-bolted with stainless steel hex head bolts.

O. All sanitary sewer laterals must be extended to the edge of the easement or road right-of-way.

P. Inflow protectors shall be installed inside manhole covers where manholes are located in paved or concrete areas. Watertight frames and covers shall be used in the vicinity of streams and wetlands or as directed.

Q. When working within existing service areas, the CONTRACTOR shall provide temporary pumping facilities as follows:

1. Prior to construction, the CONTRACTOR shall provide temporary pumping facilities to isolate that section of the existing sewer which is affected by the work. These facilities shall consist of a minimum of two pumps, with one of the pumps to be a standby in case of mechanical failure. Each pump shall be sized to handle the peak flows from the existing sewer. The CONTRACTOR shall submit to the AUTHORITY for review the type and size of temporary pump to be used before any construction is started.

2. The CONTRACTOR shall provide a portable generator or make whatever temporary electrical connections are required for operation of the temporary pumps if they are electrically operated.

3. The CONTRACTOR shall maintain the temporary pumping facilities at the site until the replacement is accepted by the AUTHORITY.

R. CONTRACTOR shall be responsible for obtaining and paying for all required permits, including Township Road Occupancy Permit, if required. Permits for road occupancy

shall be issued to the AUTHORITY. CONTRACTOR shall provide 72-hours notice to the AUTHORITY prior to work within public right-of-way of any road. Restoration will be subject to AUTHORITY inspection.

S. PADOT Publication 213 will govern all traffic control for work along or across Township or PADOT roads.

T. CONTRACTOR is required to notify the AUTHORITY a minimum of 48 hours in advance of starting or stopping work for the scheduling of inspection.

3.02 All work performed in connection with the extension, modification or improvement of public wastewater facilities within the Township shall be required to conform with all AUTHORITY Rules and Regulations and shall be inspected during construction by an authorized representative of the AUTHORITY.

3.03 All completed work shall be required to meet the approval of the AUTHORITY and shall be changed, modified, replaced, removed or otherwise corrected by the CONTRACTOR to such extent as directed by the AUTHORITY. Top of manholes are to remain visible at all times and are under no circumstances to be backfilled over.

3.04 The work will be periodically or continuously inspected during its progress and when completed, shall be inspected jointly, by the AUTHORITY and the CONTRACTOR. If the work is declared to be substantially complete and is accepted by the AUTHORITY, the eighteen-month maintenance bond period shall commence. During the term of the maintenance bond the CONTRACTOR shall return when and as required to reconcile any problems resulting from construction, such as leakage, mechanical malfunctions, trench settlement, pavement failure, surface restorations, drainage, etc. In addition, a maintenance bond inspection shall be made by the AUTHORITY at a date between twelve (12) and eighteen (18) months following the date of declaration of completion of construction. The CONTRACTOR will be notified in advance of that inspection date and shall participate therein. A closed-circuit television (CCTV) inspection of the new sanitary sewer must be performed by the CONTRACTOR between twelve (12) and eighteen (18) months following the date of declaration of completion of construction and provided to the AUTHORITY in the form of a DVD.

End of Section

SECTION 01039

COORDINATION UTILITY LINE CONSTRUCTION

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 AUTHORITY'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 AUTHORITY'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 AUTHORITY representative. Such work must be completed during the specific periods authorized by the AUTHORITY'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

Not Used.

PART 3: EXECUTION

Not Used.

End of Section

SECTION 01039

COORDINATION UTILITY LINE CONSTRUCTION

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SECTION 01042

SUPPLEMENTAL UTILITY LINE CONSTRUCTION CONDITIONS

PART 1: GENERAL

1.01 WORK INCLUDED

A. FIELD MEASUREMENTS

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.

Should interferences occur which will necessitate deviations from layout, the AUTHORITY shall be notified and any changes approved before proceeding with the work.

B. LIFTING ATTACHMENTS

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

The CONTRACTORS shall assume full responsibility for all equipment received by them and shall provide adequate protection against exposure to the elements in accordance with the manufacturers recommendations.

D. NAMEPLATES

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

Work after dark will not be permitted except under extreme emergency, or only under special directions, and approval of Moon Township and Moon Township Municipal Authority. The placing of concrete shall be started early enough in the daylight hours to insure completion of the section under construction before dark.

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 AUTHORITY, and only with the AUTHORITY's approval. The CONTRACTOR shall provide all lights required for the proper and expeditious carrying on of any work.

F. WEATHER CONDITIONS

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 AUTHORITY 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 AUTHORITY for damage to the work from weather elements.

G. PERIODIC CLEAN UP; BASIC SITE RESTORATION

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.

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.

The CONTRACTOR shall perform the clean up work on a regular basis and as frequently as ordered by the AUTHORITY. 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 AUTHORITY, if partially completed facilities must remain incomplete for some time period due to unforeseen circumstances.

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 AUTHORITY may, without prejudice to any other rights or remedies of the AUTHORITY, cause such work for which the CONTRACTOR is responsible to be accomplished to the extent deemed necessary by the AUTHORITY, 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

The AUTHORITY 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.

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

SECTION 01042

SUPPLEMENTAL UTILITY LINE CONSTRUCTION CONDITIONS

I. CODES AND ORDINANCES

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 AUTHORITY and shall not encumber the job site.

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 AUTHORITY pertaining thereto, including any laws, ordinances, rules, regulations and instructions regarding signs, advertising, fire and/or smoking.

J. SAFETY REGULATIONS

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.

Nothing in any paragraphs of these Specifications 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

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 AUTHORITY hereby notifies the CONTRACTOR that the AUTHORITY has no knowledge of hazardous materials existing at the site where work is to be performed.

The AUTHORITY, 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 AUTHORITY, 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

The construction activities required to be performed in conduct of the work may 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, gas and 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

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 AUTHORITY'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 AUTHORITY, 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 AUTHORITY 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 AUTHORITY, 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

Not Used.

PART 3: EXECUTION

Not Used.

End of Section

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PART 1: GENERAL

1.01 WORK INCLUDED

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SECTION 01042

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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 AUTHORITY, 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.

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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 AUTHORITY'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 AUTHORITY, 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 AUTHORITY 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 AUTHORITY, 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

Not Used.

PART 3: EXECUTION

Not Used.

End of Section

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 complete listing of Standard and Publications used in preparing these Specifications is located in Appendix A-1.

PART 3: EXECUTION

Not Used.

End of Section

SECTION 01090

REFERENCES

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SECTION 01170

SURVEYS

PART 1: GENERAL

1.01 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 set Benchmarks, 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 any and all 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 AUTHORITY for checking grades and/or alignments when the AUTHORITY deems it necessary to have such assistance.

PART 2: PRODUCT

Not Used.

PART 3: EXECUTION

3.01 Laser beams shall be operated by trained personnel and the proper safety precautions are adhered to either as suggested by the manufacturer or as required by Commonwealth Law.

3.02 The pipe shall be checked with a level between 50 and 100 feet out of the manhole to assure that the laser beam is on the correct grade.

3.03 The pipe shall be checked at each manhole to assure that it is on the correct line and grade.

3.04 Copies of CONTRACTOR’s cut sheets shall be provided to the AUTHORITY’s resident construction representative and the AUTHORITY for review.

SECTION 01170

SURVEYS

3.05 The CONTRACTOR shall keep on site, and make available upon request by the AUTHORITY, a surveyor’s rod and level for the purpose of spot-checking elevations as the work progresses.

3.06 The CONTRACTOR shall also keep and make available a 300’ surveyors tape for the purpose of spot checking distances and for the purpose of the CONTRACTOR providing off-set measurements as the work progresses.

End of Section

SECTION 01301

SUBMITTALS FOR UTILITY CONSTRUCTION

PART 1: GENERAL

1.01 WORK INCLUDED

A. SHOP DRAWINGS

Each CONTRACTOR shall submit to the AUTHORITY 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 AUTHORITY, ENGINEER and AUTHORITY 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 AUTHORITY 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.

The AUTHORITY will review submittals only for conformance with the design concept of the project and with the information given in the Authority specifications. Review of submittals shall not relieve the CONTRACTOR from responsibility for deviation from the AUTHORITY'S requirements unless specifically noted in the submittal and no exception is taken by the AUTHORITY. 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.

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

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 AUTHORITY.

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:

1. Shop Submittal Number _____
2. Deviations: None_____: As Listed:_____
3. Reference Specification Number _____
4. Reference Drawing Number _____
5. Space Requirement: As Designed _____
6. Different, as Listed _____
7. Contractor has reviewed and submitted for review
8. Signature _____
9. Date _____

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

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.

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

The CONTRACTOR shall be responsible for maintaining one (1) reasonably clean set of drawings of the proposed improvements at the job site, on which he shall note changes in pipe line alignments and elevations and, any other changes from the pre-construction approved plans. He shall also reference the location of the ends of sewer service laterals so that the same may be uncovered and connected at future times.

The set of prints on which such field information is recorded shall be turned over to the AUTHORITY providing a daily construction progress record and identify all noted changes to the project, prior to AUTHORITY acceptance of the facilities.

A disk containing approved construction drawings in a software format approved by the AUTHORITY (AutoCAD Version 2011) shall be provided to the AUTHORITY by the Developer’s Engineers. The Record information shall include, but not be limited to, manhole inverts, line lengths, slopes, wye locations, offset dimensions, and detailed information on all other aspects of the construction of the facilities. The cost of the As-Built Drawings and Final survey shall be invoiced to and paid by the DEVELOPER.

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

D. PHOTOGRAPHS/VIDEO TAPE (OPTIONAL)

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 DVD 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 AUTHORITY.

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 the project.

2.02 STEEL PRODUCTS

B. Each CONTRACTOR, equipment and material supplier on the project is notified that materials utilized on the project 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 with each initial shop drawing submittal.

PART 3: EXECUTION

3.01 SCOPE OF WORK

A. The CONTRACTOR shall furnish submittals for all construction materials to be incorporated into the project.

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 is completed and the new facilities are placed in operation by the Authority's personnel or by CONTRACTOR with AUTHORITY's authorization.

B. TEMPORARY WATER CONTROL: At all times during the construction of work maintain the flow of storm water, naturally occurring water and wastewater in existing facilities and channels affected by the Work. CONTRACTOR assumes risk from floods or other causes, and any damages done to the work in progress or to work completed. Make repairs and replacements to the satisfaction of the AUTHORITY. 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. 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. The means and methods the CONTRACTOR employs to meet above requirements are at his discretion but will be subject to the AUTHORITY's approval.

PART 2: PRODUCTS

Not Used.

SECTION 01500

TEMPORARY FACILITIES AND CONTROLS

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 01550

TRAFFIC CONTROL

PART 1: GENERAL

1.01 Whenever in the AUTHORITY'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 Moon Township School District (for bus routing) and Moon Township 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 "Temporary 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 Pennsylvania Department of Transportation for approval, prior to commencing with field construction.

SECTION 01550

TRAFFIC CONTROL

PART 2: PRODUCTS

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

Reference Section 01551 Barriers and Enclosures.

End of Section

SECTION 01551

BARRIERS AND ENCLOSURES

PART 1: GENERAL

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.

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

Not Used.

PART 3: EXECUTION

Not Used.

End of Section

SECTION 01551

BARRIERS AND ENCLOSURES

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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 project locations shall be in accordance with the project approved Erosion and Sedimentation Pollution Control Plan. Where the Erosion and Sedimentation Pollution Control Plan calls for runoff devices or the AUTHORITY 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 Developers Approved Plan. The CONTRACTOR shall be responsible for all fines, fees, penalties, etc. imposed upon the AUTHORITY as a result of the CONTRACTORS construction activities, methods/ procedures and or lack of construction activities methods/procedures.

SECTION 01570

TEMPORARY EROSION AND SEDIMENT CONTROL

1.02 APPROVED PLAN

A. It shall be the Developer's responsibility to prepare and have approved an Erosion and Sedimentation Pollution Control Plan and be responsible for all associated approval/permitting fees.

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 and Sedimentation Pollution 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 approved Erosion and Sedimentation 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.

SECTION 01570

TEMPORARY EROSION AND SEDIMENT CONTROL

PART 3: EXECUTION

3.01 GENERAL REQUIREMENTS

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

E. The CONTRACTOR shall assure that the approved Erosion and Sedimentation Pollution 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 Sedimentation Pollution 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, 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.

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

S. 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.

T. 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.

U. 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 AUTHORITY's 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.

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 silt fence when directed by AUTHORITY's 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 02230.

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. Stabililized Construction Entrance

1. Definition: Temporary construction entrance constructed of aggregate on top of roadway geotextile, type B, used to reduce or eliminate tracking of soils materials onto paved streets and other paved areas.

2. Location: Install at locations where construction traffic enters and leaves construction site from or onto paved street or paved area.

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

J. 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.

K. Stream Crossing

1. Stream crossings shall be accomplished by installing the sewer pipe to the specified grade and depth. The sewer pipe shall be Ductile Iron Pipe with restrained joints. In general, three feet of cover shall be provided. One foot of cover shall be provided where the sewer is located in rock. In this instance, the Ductile Iron Pipe shall be encased in concrete with a minimum thickness of 12" 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.

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 Sedimentation Pollution Control Plan. Dewatering of trenches shall be done in accordance with the requirements set forth in these specifications and the Erosion and Sedimentation Pollution Control Plan narrative. Backfill shall consist of the excavated material unless the same is deemed unsuitable by the AUTHORITY's Representative at the time of excavation. A temporary sedimentation control device approved by the Soil Conservation Service shall be utilized in the stream during installation of said sewer line

crossings. Restoration shall proceed in accordance with the approved Erosion Sedimentation Control Plan.

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. Restoration shall proceed in accordance with the approved Erosion Sedimentation Control Plan.

L. Wetland Crossing

Wetland Crossing shall be as specified in the Approved Erosion and Sedimentation Pollution Control Plan, and as permitted by the Pennsylvania DEP.

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 Sedimentation Pollution Control Plan Permit during construction operations.

C. Pennsylvania Department of Environmental Protection must approve changes to approved Erosion and Sedimentation Pollution Control Plan.

End of Section

SECTION 01651

UTILITY PIPE LINE/COMMISSIONING

PART 1: GENERAL

1.01 WORK INCLUDED

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.

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

PART 2: PRODUCTS

Not Used.

PART 3: EXECUTION

3.01 INSTALLATION

A. INSPECTION AND TESTS

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.

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

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

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 AUTHORITY. 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 AUTHORITY at the successful completion of each test.

B. COMMISSIONING

Pipe lines shall be put in operation upon successful testing and upon authorization by the AUTHORITY.

C. FINAL CLEAN UP; SITE REHABILITATION

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 AUTHORITY in a neat and orderly condition.

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 approved drawings or ordered by the AUTHORITY.

D. FINAL INSPECTION

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

The AUTHORITY 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 AUTHORITY shall be kept clean by the CONTRACTORs, until the final acceptance of the entire work.

SECTION 01651

UTILITY PIPE LINE/COMMISSIONING

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

When such further cleaning or repairing is completed, the AUTHORITY, upon further notice, will again inspect the work. The facility will not be commissioned until the CONTRACTOR has complied with the requirements set forth and the AUTHORITY 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 Specifications and approved drawings.

End of Section

SECTION 01651

UTILITY PIPE LINE/COMMISSIONING

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SECTION 01700

RIGHTS OF WAY

PART 1: GENERAL

1.01 The alignments and locations of the proposed pipelines and appurtenances are shown on the plans on which street, highway and/or other acquired rights-of-way limits have also been superimposed. No pipelines shall be relocated outside of the streets or other right-of-way within which it is shown without obtaining the formal written approval for such change from the AUTHORITY.

1.02 Where a special pipe line right-of-way is obtained through private property, the minimum permanent width for operation and maintenance purposes shall be 20 feet; the width of the temporary right-of-way obtained through such private properties for initial pipe line installation and construction purposes shall be 40 feet, 10 feet of which shall be located adjacent to and on the outside of both limits of the permanent right-of-way. The minimum distance between the center of any longitudinal pipe line and the right-of-way limit line shall be 5 feet. All construction activities shall be confined within the 40 feet wide construction right-of-way unless the CONTRACTOR makes additional arrangements with the property owner.

1.03 The CONTRACTOR shall make his own arrangements for office space, materials storage yards, change trailers, sanitary facilities, utility services, debris disposal sites, and; for ingress and egress to any location along the pipeline project for which the CONTRACTOR desires or requires use and, for which the AUTHORITY has been granted no such right-of-way.

1.04 CONTRACTOR is directed to the provisions of the Underground Utility Line Protection Law Act 287 (1974), as amended, by Act 187 of 1996 and full compliance therewith is required of the CONTRACTOR. The CONTRACTOR is required to notify facility owners through PA One Call System not less than

three (3) working days or more than ten (10) working days prior to excavation or demolition work.

1.05 The position of sewer lines proposed to be constructed in connection with land development projects shall be such that, regardless of the sequencing of various utility line construction (gas, power, telephone, water, storm sewer, sanitary sewer, etc.) no pipe line shall be aligned longitudinally, along the sanitary sewer lines, within five (5) feet. It is imperative that such minimum distance be maintained along all sanitary sewer and water lines to provide space required for future maintenance and/or repairs.

1.06 In accordance with the regulations of the Pennsylvania Department of Environmental Protection, the separation between water and sewer pipe shall be as is shown in Appendix A-2.

PART 2: PRODUCTS

Not Used.

PART 3: EXECUTION

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.

1.02 The CONTRACTOR shall also restore to its original condition and to the satisfaction of the AUTHORITY 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.

1.03 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

Not Used.

PART 3: EXECUTION

Not Used.

End of Section

SECTION 01740

CLEAN UP OF WORK SITE

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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

Not Used.

PART 3: EXECUTION

Not Used.

End of Section

SECTION 01741

DUST AND MUD CONTROL

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SECTION 02000

SITE WORK

DIVISION 2 - SITE WORK

PART 1: GENERAL

Under this Division the CONTRACTOR shall furnish all materials, labor, plant, utilities and equipment necessary to perform work related to clearing, excavation, backfill, site drainage, outside piping, roads and other site improvements and site restoration work, all as required for Construction of Sanitary Sewers and Appurtenances.

1.01 WORK INCLUDED

All work shall be performed in accordance with the requirements of the approved construction drawings 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.

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

Not Used.

PART 3: EXECUTION

Not Used.

End of Section

SECTION 02000

SITE WORK

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SECTION 02040

SITE PREPARATION

PART 1: GENERAL

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.

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

Not Used.

PART 3: EXECUTION

Not Used.

End of Section

SECTION 02040

SITE PREPARATION

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SECTION 02080

BYPASSING SEWAGE

PART 1: GENERAL

1.01 The CONTRACTOR shall provide all plant, supervision, labor and materials to bypass sewage around the existing manhole section that the new sewer line connects into. Pumps and bypass lines shall be of adequate capacity to handle the sewage flow plus additional flow that may occur during a rainstorm. The CONTRACTOR is cautioned that the estimated flows do not include contributions from any infiltration or inflow that may exist at the time of the work. The existing flows include those from upstream collection components that contribute to the subject sanitary sewer mains or manhole facilities.

1.02 By-pass pumping shall consist of flow diversion as necessary to prevent back-ups creating damage or nuisance where the testing and/or sewer replacement is in progress. By-pass shall be performed by pumping the existing flow from upstream to downstream of the stretch of sanitary sewer involved in the particular operation, after obtaining approval from the AUTHORITY. The CONTRACTOR shall provide and operate all pumps, hoses, and other conduits of adequate capacity which are necessary to prevent back-up. By-pass pumping, when required, shall continue until the particular item or work which is being performed in the section of Sewer involved has been completed. By-pass pumping operations shall be manned continuously until the work is complete. Back-up pumps are required to be on site in case of pump failure.

1.03 In no case will by-pass pumping be permitted at times other than during hours of investigation, rehabilitation, and construction approved by the AUTHORITY.

1.04 Raw sewage spillage caused by equipment malfunction shall be cleaned and disinfected by the CONTRACTOR using disinfectants approved by the AUTHORITY. Under no circumstances shall the CONTRACTOR allow the discharge of sewage into existing storm drain system, waters of the Commonwealth, or onto the ground.

SECTION 02080

BYPASSING SEWAGE

1.05 The CONTRACTOR shall be liable for all damages which result from sewage flows not properly maintained during the progress of the work, including all damages to private property which occur as a direct or indirect result of inadequate control of the sewage flow while the bypass operation is ongoing.

PART 2: PRODUCT

Not Used.

PART 3: EXECUTION

Not Used.

End of Section

SECTION 02140

DEWATERING

PART 1: GENERAL

1.01 WORK INCLUDED

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

Not Used.

PART 3: EXECUTION

Not Used.

End of Section

SECTION 02140

DEWATERING

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SECTION 02150

SHORING

PART 1: GENERAL

1.01 WORK INCLUDED

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

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

Not Used.

PART 3: EXECUTION

Not Used.

End of Section

SECTION 02150

SHORING

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SECTION 02151

ANCHORING AND BLOCKING

PART 1: GENERAL

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

All bends in excess of 10 degrees, plugs, caps, tees, wye branches, and fire hydrants shall be blocked or anchored. Concrete blocking shall conform to the standards shown in the Standard Details related to the installation of each specific bend, fitting or connection.

PART 2: PRODUCTS

See Concrete Section 03300.

PART 3: EXECUTION

Not Used.

End of Section

SECTION 02151

ANCHORING AND BLOCKING

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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 AUTHORITY. 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 AUTHORITY nor the AUTHORITY ENGINEER is responsible for the correctness or sufficiency of the information given;

b. That the CONTRACTOR shall have no claim for delay or extra compensation or damage against the AUTHORITY or the AUTHORITY 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 information provided; and

c. That the CONTRACTOR shall have no claim for relief from any obligation or responsibility related to the work, in case the location, size or character of any pipe, electrical or signal facility or other underground structure is not as indicated by the AUTHORITY, or in case any pipe, electrical or signal facility or other underground structure is encountered that was previously identified by the AUTHORITY.

B. Digging Test Pits:

1. 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 AUTHORITY and authorized representative of the company who owns and maintains 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 AUTHORITY of the subsurface utility.

2. Digging test pits in locations required by the AUTHORITY will be at the CONTRACTOR’s expense.

3. Test pits or other miscellaneous excavation dug to obtain information on subsurface conditions or underground obstructions will be at the CONTRACTOR's expense.

C. AIR/VACUUM TEST HOLE SUBSURFACE UTILITY LOCATION

1. 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 being uncovered until the location and elevation is determined.

2. The Air/Vacuum Excavation whether required by the AUTHORITY or otherwise will be at the CONTRACTOR’s expense.

3. Excavations to obtain information on subsurface conditions or underground obstructions will be at the CONTRACTOR's expense.

SECTION 02210

SUBSURFACE EXPLORATION

PART 2: PRODUCTS

Not Used.

PART 3: EXECUTION

Not Used.

End of Section

SECTION 02210

SUBSURFACE EXPLORATION

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SECTION 02220

EXCAVATING, BACKFILLING, AND COMPACTING

PART 1: GENERAL

1.01 WORK INCLUDED

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 additional costs for hand excavation or for rock, shale, masonry, etc., encountered in construction shall be completed at the CONTRACTOR’s expense.

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.

All open excavation which presents a hazard to personnel or equipment on the construction area shall be adequately barricaded and posted by the CONTRACTOR 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 AUTHORITY.

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 the CONTRACTOR’s expense.

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 AUTHORITY.

SECTION 02220

EXCAVATING, BACKFILLING, AND COMPACTING

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 AUTHORITY.

PART 2: PRODUCTS

Not Used.

PART 3: EXECUTION

3.01 EXCAVATION AND BACKFILL FOR STRUCTURES

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.

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.

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. Where specified on drawings or directed by AUTHORITY, inlet 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.

Backfill around structures shall not be placed until approval is received from the AUTHORITY 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.

Backfill around all structures and in all trenches shall be carried to the 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.

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, where 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 AUTHORITY 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

All excavation for pipelines shall be constructed in open trenches shall be unclassified the cost associated with rock, boulders, shale, timbers, logs, old foundations, masonry, or other natural or artificial materials encountered in the trenching operations shall be at the expense of the CONTRACTOR.

The grade and alignment of the pipe shall be maintained by the laser beam.

The depth of trenches shall be such that the location of the proposed pipes will conform with the lines and grades for the proposed sewer mains or as revised and approved by the AUTHORITY. 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.

The AUTHORITY reserves the right to require changes in lines and grades of pipelines, and in locations of pipes and appurtenances when and where such changes may be necessary and advantageous. Such changes will be made at the CONTRACTOR’s expense and subject to review and approval by the AUTHORITY.

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(s) and shall conform to the Standard Details for “Typical Bedding”. 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 AUTHORITY 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 AUTHORITY at the CONTRACTOR’s expense.

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.

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. The CONTRACTOR shall indemnify, and hold harmless the AUTHORITY from any claim by any property owner which the CONTRACTOR enters into a private agreement with for damages resulting from the execution of work under the CONTRACTOR’s private agreement with said property.

Where muck, quicksand, soft clay, swampy or other material is encountered in the trench bottom, which in the opinion of the AUTHORITY is unsuitable for pipe foundation subgrade or backfill, such material shall be removed to a depth satisfactory to the AUTHORITY. The trench shall then be backfilled to grade with acceptable material, mechanically compacted in successive layers.

The AUTHORITY may require that sheeting, shoring and/or bracing installed for trench excavation be left in place in order to protect adjacent facilities or structures. 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.

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 AUTHORITY in the field during construction.

3.03 PIPE BEDDING AND PIPE ZONE BACKFILL MATERIAL

Where flexible material pipelines are installed or where ductile iron pipelines are installed in rock, piping shall be supported on a granular material such as 2B limestone or 2B river gravel complying with the gradation and classification for the Pennsylvania Department of Transportation or similar material approved by the AUTHORITY with a minimum depth of 0.5 ft. below the bottom of the pipe installed for the full width of the trench. For plastic 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 AUTHORITY 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

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 2A limestone material complying with the gradation and classification for the Pennsylvania Department of Transportation or similar material approved by AUTHORITY with a minimum depth of 1 ft. above the pipe installed for the full width of the trench. No slag material shall be permitted as select

backfill material.

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

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 AUTHORITY 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. Polyvinyl-chloride 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.

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 AUTHORITY representative, subject to demonstration by the CONTRACTOR that satisfactory end results can be attained.

Unsatisfactory trench settlements occurring within 18 months after completion of the work shall be the responsibility of the CONTRACTOR at his own expense.

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 bulldozing 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 AUTHORITY. All costs associated with the proper removal and disposal of unsuitable materials in the embankments and fill materials shall be the cost of the CONTRACTOR.

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 from 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

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

If, in the opinion of the AUTHORITY, additional rolling is required to obtain optimum compaction, the CONTRACTOR shall perform the same at his own expense. The design and operation of tamping rollers shall be subject to the approval of the AUTHORITY, who 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

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

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.

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 AASHTO 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, AASHTO Test T 85) times 62.3 pounds per cubic foot.

D. The Rip-Rap shall meet National Stone, Sand and Gravel Association (NSSGA) requirements and shall be placed on a filter blanket.

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

SECTION 02230

RIP RAP

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 wind-rows.

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 geotex-tile 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 stream bed elevation. Rock Rip-Rap will be placed starting at the lowest elevation of a toe trench as shown on the drawings.

End of Section

SECTION 02230

RIP RAP

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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 AUTHORITY 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.

SECTION 02298

BORING

1.03 REFERENCES

A. American Association of State Highway and Transportation 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 AUTHORITY.

C. Environmental Requirements:
As specified 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 and Thickness: As shown on the Drawings.

2.02 CARRIER PIPE AND FITTINGS

A. Carrier Pipe shall be Class 52 Ductile Iron pipe with Field-Lok gaskets as required by the Railroad or Pennsylvania Department of Transportation permitting the construction.

2.03 MISCELLANEOUS MATERIAL

A. Concrete: As specified in Cast-In-Place: Section 03300.

1. Class B: 3500 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. Casing Spacers (Pipe support in conduit): Casing spacers shall be a two-piece shell per carrier pipe and made from T-304 Stainless Steel of a minimum 14 gauge thickness. Each shell section shall be lined with a 0.090″ thick, ribbed PVC extrusion with a retaining section that overlaps the edges of the shell and prevents slippage. Bearing surfaces (Runners) shall be ultra high molecular weight polyethylene (UHMW) to provide abrasion resistance and a low coefficient of friction (0.12). Runners shall be attached to support structure (Risers) at appropriate positions to properly support the carrier pipe within the casing pipe and to ease installation. The Runners shall be mechanically bolted to the Risers. The bolt heads are welded to the inside of the risers for strength. Risers shall be made of T-304 stainless steel of a maximum 10 gauge. All Risers shall be MIG welded to the shell. Bottom Risers 6″ and over in height shall be reinforced. All reinforcing plates shall be 10 gauge T-304 stainless steel and shall be MIG welded to all mating parts. All welds and metal surfaces shall be chemically passivated. Casing spacers shall be Model CCS as manufactured by Cascade Waterworks Mfg. Co. of Yorkville, Illinois or an approved equal product.

E. Casing End Seals: Casing End Seals shall be manufactured from 1/8″ thick resilient neoprene rubber, and be provided with 1/2″ wide T-304 stainless steel bandings with 100% non-magnetic worm gear mechanisms.

1. Physical Properties:

Temperature Limits	-20F to +212F
Color	Black
Finish	Smooth

Durometer	60 +/-5
Average Tensile	1000 PSI
Average Elongation	350%
Specific Gravity	1.5
Polymer Content	20%

End Seals shall be as manufactured by Advanced Products and Systems, Inc. or an approved equal manufacturer. APS standard models AC, AW, AZ, AM and APS Innerlynx IL-S304/316 approved end seal models.

F. 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 AUTHORITY 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:
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 AUTHORITY.

3.03 PERFORMANCE

A. All pipelines where approved for construction shall be bored or augured in place at the elevations and along the alignments approved for construction. 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 AUTHORITY.

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. The CONTRACTOR shall have the option to install a larger diameter encasing conduit upon approval by the AUTHORITY. There shall be no additional payment due to the CONTRACTOR by the AUTHORITY for installing a larger diameter encasing conduit. 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 Casing Spacers and End Seals in accordance with MTMA Standard Detail SD-039.

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.

End of Section

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 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 AUTHORITY will determine when a defect is a latent defect. The CONTRACTOR shall satisfactorily repair or correct latent defects, at no expense to the AUTHORITY. If the defects cannot be satisfactorily repaired or corrected, provide reimbursement for any expenses or damages incurred by the AUTHORITY 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 AUTHORITY except if the damage is due to unforeseeable causes beyond the control of the CONTRACTOR, as determined by the AUTHORITY.

D. 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 traffic from the new surface courses after placement of materials to permit adequate stability and adhesion of the aggregate.

E. All distribution and trucks used 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.

F. 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 Form 408, latest edition, or any amendments thereto.

G. 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 Penn Dot Form 408, current 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 gravel or crushed limestone manufactured from approved sources as listed in Bulletin No. 14 "Aggregate Products", Publication No. 34, and current edition.

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

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

E. Bituminous concrete mixtures shall be manufactured as approved and specified in Bulletin No. 27 and be from approved sources as listed in Bulletin 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 Penn DOT Form 408 dated 1987 and all amendments thereto including current editions.

G. All material furnished, delivered or applied shall comply with the requirements of Section 106 "Control of Material" of Form 408 dated 2000 as amended.

H. Materials required to meet Penn Dot’s specifications shall be tested in accordance with the requirements of Form 408 dated latest edition.

I. Flexible Pavements: Subbase for widening, repairs and reconstructed areas.

1. Excavate and prepare the subgrade prior to placing subbase.

2. Install Class 4 Geotextile material as specified in Form 408, Section 212.

3. Install an 8" aggregate base consisting of 5½" compacted No. 3 stone, 2" compacted No. 57 stone and ½" choke course No. 8 stone. Aggregate shall meet the requirements of PADOT Publication 408.

J. 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 Form 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 Form 408, Section 460 "Bituminous Tack Coat".

5. The tack coat shall be E-8 Emulsified Asphalt. CONTRACTOR shall submit a certified affidavit that material complies with Penn DOT Form 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.

K. Superpave HWA Binder Course

1. The Superpave HWA Binder Course material shall be furnished and placed in locations as specified herein and by the AUTHORITY.

2. Keyways shall be cut at limits of work.

3. CONTRACTOR shall furnish, place and roll a 2½" compacted depth Superpave HWA Binder course as specified and meeting the requirements of Form 408, Section 421 "Bituminous Binder Course ID-2".

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

5. Areas to be covered with bituminous binder course material will be as shown on the drawings.

L. Superpave HWA Wearing Course (Standard)

1. The Superpave HWA Wearing Course Standard shall be furnished and placed as specified herein and by the AUTHORITY.

2. CONTRACTOR shall furnish and place, and roll a 1 1/2" compacted depth Superpave HWA Wearing Course material on the prepared roadway/formed curb surface as specified and meeting the requirements of Form 408, Section 420 "Bituminous Wearing Course ID-2.

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

4. The coarse aggregate used in the preparation of the surface course shall be Type "A". Provide combined gradation with fine aggregate in accordance with Form 408 Section 401.2(d) Table A.

M. Joints

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.

2.02 ASPHALT WEDGE CURB

A. At the locations shown on the Contract Drawings, the CONTRACTOR shall install an asphalt wedge curb.

B. The Asphalt Wedge Curb shall be in accordance with Standard Detail SD-047.

2.03 STONE ACCESS ROAD

A. Stone Access Road shall be installed at the location shown on the Contract Documents. Construction shall be in accordance with the construction details.

B. The road base shall consist of the installation of a PA DOT Class 4 geotextile fabric, an 8 inch base course consisting of 5 ½ inches of No. 3 stone, 2 inches of No. 57 stone and ½ inch choke course of No. 8 stone. The surface shall be finished with 2 inches of 2B limestone.

PART 3: EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

A. Where construction activities damage or disturb cartway, berms and/or shoulders along State Highways, County Roads, Municipal and Private Roads, 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 Highways 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 the road and or/berm along Allegheny County Roads, Municipal Roads and Private Roads shall be modified 2A limestone material mechanically compacted in 6 inch lifts. The noted suitable backfill shall be the specified modified 2-A limestone and the pipe zone shall meet the requirement as specified in the Technical Specification. Where open trenches cross Municipal Streets or Roads, 2A limestone 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 PADOT right of ways and/or County Road 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 at least equivalent to 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 acceptance.

D. All paving and/or berm areas disturbed or damaged along State Highways as a result of pipeline construction or by other activities of the CONTRACTOR shall be replaced in a manner to equal or exceed the quality of the existing surfaces and, to the satisfaction of the AUTHORITY, PADOT, and the conditions of the Highway Occupancy Permit as issued. 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 outside of the trench area will be restored by the CONTRACTOR at his cost to the requirements listed in 3.01D.

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 AUTHORITY.

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 Specifications, Section 962, and all other applicable sections.

3.02 STATE HIGHWAY – NON-RIGID PAVING

A. All non-rigid bituminous surface paving shall be restored by neatly and uniformly cutting the edges 12 inches outside each edge of the opening and placing a base course and surface course over the trench fill in accordance with requirements of the Pennsylvania Department of Transportation Form 408. The base course shall be 8 inch bituminous concrete base course placed in two compacted 4 inch layers, in accordance with Sections 305, 310, 311, or 322. The surface course shall be 2 inches Superpave HWA binder followed by Superpave HWA wearing course totaling 1-1/2″ after compaction. Seal edges with hot bituminous liquid.

B. The surface and wearing course shall extend a minimum of 1 foot beyond each side of the trench as directed by Pennsylvania Department of Transportation. CONTRACTOR shall install all keyways and or pavement milling as required to complete the installation.

C. There are areas along state highways where the proposed pipeline will be adjacent to or encroach upon the improved shoulder or where bore pits may be located in or adjacent to the improved shoulder. In those areas where the shoulder is damaged as a result of sanitary sewer construction the trench in the shoulder area shall be backfilled full depth with select material (2RC) compacted in lifts as described previously in these technical specifications. The improved shoulder surface shall be restored to a condition equivalent to that existing prior to construction.

3.03 ALLEGHENY COUNTY ROADS – NON-RIGID PAVING

A. Prior to excavation the trench shall be neatly saw cut and the sewer installed as specified. Prior to surface restoration the paving shall be sawcut 12 inches beyond the excavated trench. All non-rigid bituminous surface paving shall be restored by a base course and surface course over the trench fill in accordance with requirements of the Pennsylvania Department of Transportation Form 408. The base course shall be 8

inch bituminous concrete base course placed in two compacted 4 inch layers in accordance with Sections 305, 310, 311, or 322. The surface course shall be 2 inch Superpave wearing course after compaction. Seal edges with hot bituminous liquid. See Exhibit "B" Allegheny County Road Restoration Detail 2.

3.04 MUNICIPAL ROADS – NON-RIGID PAVING

A. All non-rigid bituminous surface paving shall be restored in accordance with local municipal specifications including those of Moon Township, Crescent Township and the Borough of South Heights. In general, surface paving shall be restored by neatly and uniformly cutting the edges and placing a base course and surface course over the trench fill in accordance with requirements of the Pennsylvania Department of Transportation Form 408. The base course shall be 5 inch (compacted thickness)(two lifts) or existing thickness, whichever is greater, of Superpave HMA. The base course shall be followed by a binder course 3 inch (compacted thickness) or existing thickness, whichever is greater, of Superpave HMA, SRL-H. The surface or wearing course shall be 1-1/2 inch (compacted thickness) or existing thickness, whichever is greater, of Superpave HMA, SRL-H. Seal edges with hot bituminous liquid.

3.05 PRIVATE DRIVEWAYS:

A. Asphalt driveways all bituminous paving shall be restored by neatly and uniformly cutting the edges and placing a base course and surface course over the trench fill in accordance with requirements of the Pennsylvania Department of Transportation Form 408. The base course shall be a 3 inch Superpave. The surface course shall be Superpave installed in one wearing course totaling 1 1/2 inch after compaction. Seal edges with hot bituminous liquid. Adapt MTMA SD-046 for overcut and pavement width.

3.06 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.

3.07 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 width of the disturbed area. The limestone shall consist of hard, tough, durable stone free from slaty 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

SECTION 02501

PLAIN CEMENT CONCRETE CURB

PART 1: GENERAL

1.01 WORK INCLUDED

The CONTRACTOR shall furnish and install plain cement concrete curb and plain concrete mountable curb at the locations shown on the contract drawings and in conformance with the contract details.

PART 2: PRODUCTS

2.01 All materials shall meet the requirements of PA Department of Transportation Publication 408 Section 630 and 633.

2.02 Class A Cement Concrete – Section 704

2.03 Class A Cement Concrete (Slip Forming) – Section 704, except with a maximum slump of 38 mm (1 ½ inches).

2.04 Premolded Expansion Joint Filler – Section 705.1

2.05 Curing and Protecting Covers – Section 711.1

2.06 Concrete Curing Compound – Section 711.2(a)

2.07 Mortar – Section 1001.2(d)

2.08 Joint Sealing Material – Section 705.4(b) or (c)

2.09 Reinforcement Bars – Section 709.1(a)

PART 3: EXECUTION

3.01 Excavate as required, and then compact the material, upon which the curb is to be constructed, to a firm even surface.

A. Use acceptable metal forms, except on sharp curves and short tangent sections, where wood forms may be used. Use forms which will not discolor the concrete.

B. Place the concrete in the forms in layers not exceeding 130 mm (5 inches) in depth when spading, or layers not exceeding 380 mm (15 inches) in depth when using a vibrator to eliminate voids. Provide drainage openings through the curb, at the elevation and of the size required, where indicated or directed. Smoothly and evenly finish the top surface of the curb, using a wood float. While the concrete is still plastic, round the edges of the face and back of the curb. Place depressed curbs for drives or curb ramps, where indicated or directed. Place bars as indicated for depressed curb at drives in accordance with Publication 408, Section 1002.3.

C. The concrete curb may be placed with an acceptable, self propelled machine. Uniformly feed the concrete to the machine so the concrete maintains the shape of the section, without slumping after extrusion. Voids or honeycomb on the surface of the finished curb will not be allowed. Immediately after extrusion, perform any additional surface finishing required.

D. Form or saw contraction joints 5 mm (3/16 inch) wide and 50 mm (2 inches) deep. Saw as soon as possible after the concrete has set sufficiently to preclude raveling during the sawing and before any shrinkage cracking occurs in the concrete. The depth of saw cut may be decreased at the edge adjacent to the pavement to obtain a maximum depth without pavement damage. Tool the edges of construction joints to a 6 mm (1/4 inch) radius.

E. Place 19 mm (3/4 inch) premolded expansion joint material, cut to the cross sectional area of the curb, at structures, and at the end of the work day. Seal joints, as specified in Publication 408, Section 501.3(n).

End of Section

SECTION 02532

POLYETHYLENE ENCASEMENT

PART 1: GENERAL

1.01 CONTRACTOR shall provide polyethylene encasement and all required plant, labor, materials and services required for installation on all ductile iron pipe and fittings where new pipe is installed in acidic soils or other conditions that may attack the integrity of the pipe.

The polyethylene encasing shall prevent contact between the pipe and the surrounding backfill and bedding and shall conform to the requirements of ANSI/AWWA C105/A21.5.

Part 2 PRODUCT

2.01 The polyethylene shall be high-density, cross-laminated polyethylene film. High-density, cross laminated polyethylene film shall be manufactured of virgin polyethylene material conforming to the flowing requirements of ASTM D1248-89.

1. Raw material – Type III, Class: A (natural color), Grade: P33, Flow Rate: (formerly melt index): 0.4 to 0.5 g/10 min, Dielectric Strength: Volume resistively, 10^{15} ohm-cm, minimum.

2. Physical Properties – Tensile Strength: 5000 psi (34.6 Mpa) minimum, Elogation: 100 percent minimum, Dielectric Strength: 800 V/mil (31.5 V/pm) thickness, minimum.

3. Thickness – Film shall have a nominal thickness of 0.004 in. (4 mil). The minus tolerance on thickness is 10 percent of the nominal thickness.

4. Polyethylene Tape shall be provided to secure the polyethylene encasing to the pipe, secure overlapped ends and repair any areas punctured during installation.
   Polyethylene tape shall be a minmum of 2″ in width and .010″, 10 Mils in thickness.

5. Tube size or flat sheet width for each pipe diameter shall be as follows:

SECTION 02532

POLYETHYLENE ENCASEMENT

For Push-On and Mechanical Joint:

Outside Pipe Diameter	Polyethylene Width Flat Tube
6″	16″
8″	20″
10″	24″
12″	27″
14″	30″
16″	34″
18″	37″
20″	41″
24″	54″
30″	67″
36″	81″
42″	81″
48″	96″

For Restrained Joint:

Outside Pipe Diameter	Polyethylene Width Flat Tube
6″	20″
8″	24″
10″	30″
12″	34″
14″	37″
16″	41″
18″	45″
20″	54″
24″	54″
30″	67″
36″	81″
42″	81″
48″	96″

PART 3: EXECUTION

3.01 All lumps of clay, mud, cinders, and so forth, on the pipe surface shall be removed prior to installation of the polyethylene encasement. During installation, care shall be exercised to prevent soil or embedment material from becoming trapped between the pipe and the polyethylene.

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

3.03 Remove rejected products from the project site.

End of Section

SECTION 02532

POLYETHYLENE ENCASEMENT

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SECTION 02609

DETECTABLE 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 at a depth above the pipe as recommended by the manufacturer and along the entire length of pipeline installed. Manufacturer's indentified on the shop drawing submittal for Detectable Marking Tape.

1.03 Marking tape shall be vividly colored in accordance with standard industry color standards. Tape shall be marked "Gravity Sewer Line" at gravity sewers, and "Intermittent Pressure Sewer" at Force Mains.

PART 2: PRODUCTS

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

PART 3: EXECUTION

Not Used.

End of Section

SECTION 02609

DETECTABLE MARKING TAPE

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SECTION 02640

VALVES

PART 1: GENERAL

A. Not Used.

PART 2: PRODUCTS

2.01 COMBINED AIR AND VACUUM RELEASE VALVE

A. The sewage combination air release and air vacuum release valve shall be furnished and installed a indicated on the approved CONTRACT drawings. Installation of the sewage combination air and vacuum release valves on a pressure sewer line is shown on Standard Detail SD-034.

B. The sewage air release valve unit of the combination air release and vacuum release valve shall be designed and constructed with a long body and float stem so that the operating mechanism will always be kept free from contact with sewage during the continuous purging or air, while the transmission main is under operating pressure. The mechanism shall be designed to allow air to reenter the valve and force main whenever loss of pressure occurs in the main.

C. The mechanism, elongated stem and float shall be designed so that the discharge orifice of the valve will be fully closed tight when the float is raised will be fully closed tight when the float is raised ½ inch by t he sewage entering the inlet at the bottom of the valve body.

D. The discharge orifice seat, float and valve tem shall be constructed of stainless steel complying with ASTM specifications. The orifice button shall be construed of stainless steel complying with ASTM Specification A-240. The body and cover shall be constructed of cast iron complying with ASTM Specification A-48, Class 35.

E. The valve inlet shall be the size specified, and the discharge orifice shall be designed to have a venting capacity of at least 50 C.F.F.A.M.

F. Combination sewage air and vacuum relief valves shall be provided with complete back-flushing and cleaning accessories and hose comprised of:
   1. 1-inch blow-off valve near the bottom of the valve.
   2. Quick disconnect couplings.
   3. ½ - inch shut-off ball valve at the top of the valve body.
   4. Rubber hose and a quick connect coupling.

G. The sewage air vacuum relief valve unit of each combination valve shall be designed and constructed with a long body and float stem with a float at each end arranged so that the larger bottom float will seat the upper float and shut off the discharge of the valve when sewage enters only the lower section of the valve body. The operation of this valve shall be designed to allow large volumes of air to be discharged when the force main is being filled and permit large volumes of air to reenter the valve and prevent vacuum whenever the pressure drops in the main. This valve shall remain closed after the initial purging of the force main, and the main remains under operating pressure.

H. The body and cover of these valves shall be constructed of cast iron; and the floats, stem, and trim shall be constructed of stainless steel complying with the respective ASTM specification noted for the sewage air release valves. The orifice seat shall be Buna-N rubber.

I. These sewage air vacuum relief valves shall have inlet and discharge orifice sizes having adequate venting capacities to properly allow the reentry of sufficient quantities of air at the proper rate to protect the force main upon a drop or loss of pressure.

J. The sewage air vacuum relief valve shall have an inlet and discharge orifice of sizes specified and have a venting capacity of not less than 800C.F.f.A.M. at an orifice differential pressure of 5 PSIG.

K. The air vacuum relief valve unit shall be provided with back-flushing accessories and hose as specified above for the sewage air relief valves. The type and size of the flushing accessories shall also be the same as specified for the sewage air relief valve. Ball valves accessory to the air vacuum relief valve shall have stainless steel balls and handles.

L. The combination air and vacuum release valve shall be completely assembled at the factory, and each assembly tested at 300 PSI hydrostatic pressure. The combination valves shall be shipped complete and fully assembled after successful testing.

M. The combination sewage air relief and vacuum relief valve shall be as manufactured by Val-Matic Valve and Manufacturing Corp. of Lyons, Illinois; APCO Valve and Primer Corp. of Schaumburg, Illinois; or an approved equal manufacturer.

2.02 SEWAGE AIR RELEASE VALVES

A. These valves shall be designed and constructed with a long body and float stem so that the operating mechanism will be kept free from contact with sewage during the continuous purging of air while the force main is under operating pressure.

B. The mechanism, elongated stem, and float shall be designed so that the discharge orifice of this valve will be fully closed when the float is raised ½ by the sewage entering the inlet at the bottom of the valve body.

C. The discharge orifice seat, mechanism and valve stem shall be constructed of stainless steel, complying with ASTM Specifications. The orifice needle shall be constructed of high strength, stainless steel, complying with ASTM Specification A240. The body and cover shall be constructed of cast iron, complying with ASTM Specification A48, Class 30.

D. The valve inlet shall be of the size specified and the discharge orifice shall be designed to have a venting capacity of at least 175 C.F.F. A. M., under a force main pressure of 50 PSIG.

E. The sewage air valve shall also be provided with back-flushing and cleaning accessories and hose including a 1-inch blow-off ball valve near the bottom of the body; quick disconnect couplings and ½-inch shut-off ball valve at the top of the sewage valve, and a section of rubber hose with quick connect couplings. Ball valves up to 2-inch in diameter for the back flushing and accessories shall have stainless steel balls and handles. Inlet valve shall be a gate valve for 3-inch diameter or greater as specified in the accompanying flanges; the air release valve with bottom inlet shall be factory tested and shipped fully assembled.

F. CONTRACTOR shall provide instructions on the operation of the valve to AUTHORITY'S operating personnel prior to AUTHORITY'S acceptance.

G. Sewage air release valves shall be as manufactured by Val-Matic & Manufacturing Corp., Lyons, Illinois; or and approved equal manufacturer.

PART 3: EXECUTION

A. Not Used.

End of Section

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 tests 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 AUTHORITY.

PART 2: PRODUCTS

2.01 POLYVINYL CHLORIDE (PVC) GRAVITY SEWER PIPE
Diameters 6 inch through 24 inch for gravity sewers.

A. Solid Wall Polyvinyl Chloride (PVC) Pipe: Provide pipe which is permanently marked with manufacturer’s trademark, size and conforming to ASTM D-1784 and class 12454-B, 12454-C or 13364-B PVC compound.

1. Pipe, Solid Wall, Size 6 through 15 Inch Diameters: Type SDR-35 conforming to ASTM D 3034 requirements, or Type PS-46 conforming to ASTM F-679 requirements for pipe sizes 18 inch to 27 inch diameter for typical depth installations. For depths of cover exceeding 15 feet, SDR 26 PVC shall be required. All pipe to be bell and spigot type furnished in lengths of approximately fourteen feet (14’).

2. Fittings: Commercially manufactured molded fittings made from PVC compounds having a cell classification of 12454-B, 12454-C, or 13343-C as defined in ASTM Specification D 1784.

3. Joints: Push–on style joint, with elastomeric gasket, conforming to ASTM D 3212 requirements for joint design; gasket conforming to ASTM F 477 requirements for material specifications, providing a watertight seal.

   a. Pipe bell design shall incorporate the gasket locked in a groove so as to prevent gasket displacement when pipes are joined.

2.02 POLYVINYL CHLORIDE (PVC) GRAVITY SEWER PIPE
Diameters 30 inch through 36 inch.

A. Closed Profile PVC Pipe: Provide pipe which is permanently marked with the manufacturer’s trademark & state code, nominal size, cell classification, ASTM designation P-1803, and pipe stiffness designation “PS-46”, and product shall be Vylon Pipe as manufactured by Lamson Vylon Pipe or approved equal.

1. Pipe, smooth interior and exterior, bell and spigot type. Pipe stiffness shall be 46 psi when tested in accordance with ASTM D 2412. Pipe shall meet the requirements of ASTM 1803 and Unibell UNI -13-9.

2. Joints: Bell and Spigot type with elastomeric seals conforming to ASTM D-3212. Gaskets to be factory installed and chemically bonded to bell end of the pipe. There shall be no gasket material on spigot end of pipe.

3. Laboratory Test: Each joint of pipe shall pass a factory air test of 3.5 PSI air as described in ASTM F-1803.

2.03 DUCTILE IRON PIPE FOR GRAVITY SEWERS

A. Ductile Iron Pipe: Provide pipe which is permanently marked with the manufacturer's trademark, size, and conforming to Pressure Class 350.

1. The Pipe shall be centrifugally cast in metal molds or sand-lined molds, for water or other liquids as described in the specifications published by the American Water Works Association ANSI/AWWA C151/A21.51.

2. Fittings shall be mechanical joint and conform to the applicable provisions of ANSI/AWWA/C110 /A21.10 and ANSI/AWWA C111/A21.11.

3. Joints shall generally be of the push-on type. The manufacturer shall furnish a sworn statement that the inspection and all of the specified tests have been made and that the results comply with the above stated specification standards.

4. All pipe and fittings shall be coated with bituminous coating and shall be provided with double cement lining in accordance with the latest revision of the ANSI/AWWA C104/A21.4 specification.

5. The push-on type joints shall be of the single rubber gasket molded to be positioned in an annular recess in the pipe or fitting and shall compress radically to form a positive seal and shall be shaped so that the gasket is locked in place against displacement. Joints shall conform to those provisions set forth in the ANSI/ AWWA/C111/A21.11 specifications, which are applicable to the push-on type. All lubricants and gaskets and any required special tools for construction of the pipeline shall be furnished by the pipe manufacturer.

6. All necessary accessories including lock ring, bolts, etc., shall be furnished and installed to accommodate the restrained and/or mechanical joints.

7. Pipe and fittings shall be similar and equal to those products manufactured by Atlantic States Cast Iron Pipe Co., American Cast Iron Pipe Company or U.S. Pipe and Foundry Company.

8. Ductile Iron Pipe installed in acidic soils or where required by the AUTHORITY shall have Polyethylene Encasement as specified in Section 02532.

2.04 DUCTILE IRON PIPE PRESSURE SEWER

A. Ductile Iron Pressure Sewer Pipe: Provide pipe which is permanently marked with the manufacturer's trademark, size and class. Pressures sewer (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 or Protecto 401 epoxy-lined or equal where indicated on the drawings. Pipe shall have push-on joint with Field Lok gaskets.

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 mechanical joint, 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, and provided with CoreTen bolts. Megalug joint restraints shall be installed where indicated on the drawings or specified by the AUTHORITY.

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 MTMA Standard Detail SD-042, SD-043, SD-044 and SD-045.

4. Ductile Iron Pipe installed in acidic soils or

where required by the AUTHORITY shall have Polyethylene Encasement as specified in Section 02532.

2.05 POLYVINYL CHLORIDE (PVC) PIPE FOR PRESSURE SEWERS (THREE INCH DIAMETER AND LARGER).

A. Pressure Sewer (Force Main) Pipe shall meet the requirements of AWWA C900 Polyvinyl Chloride (PVC) Pressure Pipe and shall be Class 200 pipe meeting the requirements of DR14. Provide pipe which is permanently marked with the manufacturer's trademark, size, and class.

1. 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 C900. Sizes and dimensions shall be as shown in the Contract Drawings.

2. 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.

3. 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.

4. All Fittings and Valves shall be installed with MEGALUG restraining glands or approved equal where indicated on the drawings or as directed by the AUTHORITY.

5. 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 Standard Details SD-042, SD-043, SD-044 and SD-045.

2.06 POLYVINYL CHLORIDE (PVC) PRESSURE SEWER PIPE DIAMETER 2 ½ INCH AND SMALLER.

A. Small diameter PVC Pressure Sewer Pipe - Provide Pipe which is permanently marked with the manufacturer's trademark conforming to SDR 21.

1. PVC Pressure Sewer Pipe shall be extruded conforming to ASTM D2241.
2. PVC Pipe Fittings shall meet the requirements of ASTM D1784.
3. Joints shall meet the requirements of ASTM D 3139 and have rubber ring seals conforming to ASTM D 1869 and F 477.

2.07 HDPE PIPE

A. Polyethylene Plastic Pipe shall be High Density Polyethylene Pipe (HDPE) and meet applicable requirements of ASTM F714. Dimension Ratios: The wall thickness of the HDPE pipe shall be DR11, or as otherwise specified.

1. HDPE pipe will be produced from resins meeting the requirements of ASTM D1248, designation PE3408, ASTM D3350 cell classification PE345444C, and will meet the requirements of AWWA C901 and C906. HDPE pipe will meet the minimum stability requirements of ASTM D3350. Pipe will be legibly marked at intervals of no more than five feet with the manufacturer's name, trademark, pipe

size, HDPE cell classification, appropriate legend such as SDR 19 or SDR 17, ASTM D3035, AWWA C901 or C906, date of manufacture and point or origin.

2. All pipe shall be made of virgin material. No rework material except that obtained from the manufacturer's own production of the same formulation shall be used.

3. The pipe shall be homogeneous throughout and shall be free of visible cracks, holes, foreign material, blisters or other deleterious faults.

4. Pipe color shall be solid black unless otherwise specified in these contract documents.

5. HDPE Pipe shall be Ductile Iron Pipe Size (DIPS) unless otherwise specified in these contract documents.

6. Unless otherwise specified, HDPE pipe lengths shall be assembled in the field with butt-fused joints. The CONTRACTOR shall follow the pipe supplier's written instructions for this procedure. Joint strength shall be equal to the pipe as demonstrated by testing requirements. All fusion joints shall be completed as described in this specification. CONTRACTOR shall remove the internal weld bead which is formed during the fusion welding process.

7. All fittings shall be fused by either butt fusion or electrofusion.

2.08 TRACER WIRE

A. A tracer wire shall be installed along PVC or HDPE pressure sewers to facilitate future line location. Tracer wire shall be 12 AWG solid copper THHN or THWN. Wire shall be brought up in curb boxes with lids lettered "SEWER".

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. Protect pipe ends from blasting, if blasting is allowed in the Project.

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 the AUTHORITY.

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 Section 02220.

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 AUTHORITY’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.

C. Gravity Service Sewer Connection Fittings:

1. Wyes: Make connections to sewer using wye fittings of same material and joint configuration as the sewer at planned point of branch connection.

a. Use commercially manufactured wye fitting.

b. Set wye branches at proper vertical angles as required to bring service connections to the proper depth.

c. Fittings locations determined by the AUTHORITY with respect to service connections to existing house or building location.

2. Plugs: Close free ends of branches and service connections with carefully fitted plugs. Type of plug used and method of installation to Engineer’s approval. Installed plugs shall successfully pass Line Acceptance Tests.

D. Small Diameter Pressure Sewer Service Connection:

1. Wyes or Tee: Make connection to Pressure Sewer using wye or tee fitting of the same material and joint configuration as the sewer at planned point of branch connection having a minimum 1 1/4 inch diameter branch connection. Reference Standard Details SD-031 and SD-032. Connections on HDPE force mains shall be fused on by either butt fusion or electrofusion.

2. Install Tee followed by corporation stop, Ford Meter box or approved equal, and 1 1/4 inch minimum diameter service connection.

3. Extend service line to the right of way line or property line as shown in the contract drawings.

4. Curb stop shall be installed with a valve box at the property line or right of way line. Curb Stop shall be 1 1/4 inch minimum diameter Ford Meter Box Model B66-666 (Pack Jt x Pack Jt) or approved equal. Compression ends on HDPE pipe require stainless steel stiffeners.

5. Valve Box shall be Bibby Ste Croix Modes #144-R or Bingham & Taylor (4 1/4") shaft Figure 4903; 4 ¼-inch or 4 1/2 inch shaft, screw type, having an extension range 40 inches to 54 inches. "SEWER" shall be cast in lid.

E. Service Line Inspection/Sight Tee. An Inspection/Sight Tee shall be installed on each new service sewer at the property line or Right of Way line directly after the Wye fitting. Reference Standard Details SD-022, SD-025, SD-025A, SD-028, and SD-028-A.

1. Inspection/Sight Tee shall consist of a Sanitary Tee or T-Wye, a riser pipe, having a minimum diameter of 6 inches and a tamper resistant cap.

2. At locations where Inspection/Sight Tee are installed on slopes that may compromise pipe stability, shall be the tee and one foot of riser pipe encased in concrete.

3. Materials for pipe and fittings shall be as required for the installed sewer line.

4. Tamper resistant cap shall be installed and conform to Standard Details SD-025 and SD-025A.

3.04 FIELD QUALITY CONTROL

A. General Requirements: Conduct tests specified herein so that each pipe line installed in the Project is tested to the AUTHORITY'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 AUTHORITY.

3. Provide 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. Pressure gauge shall be calibrated in increments of 0.1 PSI and have a range from 0 to 10 PSI.

6. Maintain testing records on a form provided by the AUTHORITY 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 AUTHORITY's approval.

4. Provide GO-NO-GO Mandrel and incidental equipment for Deflection Test. Mandrel to conform to following requirements:

   a. Cylindrical in shape with not less than nine arms spaced evenly around the mandrel.

   b. Minimum contract length of mandrel arms with pipe wall not less than the nominal diameter of the pipe being tested.

   c. Mandrel diameter 95 percent of inside pipe diameter.

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 AUTHORITY.

D. Gravity Sewer Line Acceptance Test: After a section of sewer and its service connections is constructed between adjacent manholes, backfilled and successfully cleaned, perform line acceptance test as specified

herein.

1. Where sewers are constructed in a location and at an elevation where the ground water elevation is 4 feet (vertically) higher than the test section of pipe, said constructed sewer pipe(s) shall be hydrostatically tested by measuring the rates and/or volume of flow of infiltration into the pipeline through the pipe joints and/or pipe walls.

2. All sewer pipes not subjected to latent external hydrostatic ground water pressure shall be tested by including low pressure air, internally, into the pipe. Said test shall not be performed until the backfill has been in place at least 10 days. Air shall be slowly introduced into the section of pipe to be tested, until the air pressure is raised to approximately 5.0 psi and the test pipe section is stabilized for 5 minutes without drop. The pressure shall then be slowly decreased to 3.5 psi to 3.0 psi shall be compared to the required time to decide if the rate of air loss is allowable. Minimum holding times required by the pipe diameter are shown in Gravity Pipe Air Test Requirements, Table 1, located at the end of this section. In the event loss does occur before the minimum time displaced in the table below or more than 0.5 psig, appropriate repairs or reconstruction shall be made and, the test procedure shall be rerun until the test criteria as displayed in the Gravity Pipe Air Test Requirements, Table I, appended to of Section 02730, is successfully accomplished.

4. In the event the AUTHORITY approves the application of internal low pressure air test where ground water elevations prevail higher than the top of the sewer pipe being tested, 0.5 psi per foot of hydrostatic head above the top of the sewer pipe shall be added to the test pressure.

5. The CONTRACTOR shall lamp each section of sewer pipe between manholes by providing a light at one

end; the AUTHORITY's field representative will observe the pipe at the other end. Sewers not constructed on uniform line and grade and, therefore, not showing a full circle of light during lamping, shall be rejected.

6. All PVC gravity sewer pipes shall also be tested for pipe deflection. Said tests shall not be performed until the backfill has been in place for at least thirty (30) days; maximum acceptable deflection shall be 5% of the vertical internal diameter. Said testing may be performed with an ASTM approved mandrel for the specified pipe diameter. Deflection testing equipment shall be required to receive the prior approval of the AUTHORITY.

   a. Completely flush the line making sure the pipe is clean of any mud or debris that would hinder the passage of the mandrel.

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

   c. After the rope is threaded through the line, connect the pull rope to the mandrel and place the mandrel in the entrance of the line segment being tested.

   d. Connect a retrieval rope to the back of the mandrel to retrieve the mandrel in case it becomes lodged.

   e. Remove all slack in the pull rope and place a tape marker on the rope at the ends of the pipe.

   f. Draw the mandrel through the sewer line. If any irregularities or obstructive are encountered in the line, corrective action shall be taken as required.

g. If a section with excessive deflection is found, it shall be located and excavated. The pipe shall be inspected for damage; if any damage is found, the pipe shall be replaced at the CONTRACTOR's expense.

h. Retest the segment for deflection.

E. Force Main (Pressure Sewer) Line Acceptance Test: Shall be conducted as specified herein after the pipe line had been constructed, restrained, anchored and blocked, backfilled and successfully cleaned, for a minimum of 36 hours.

1. A hydrostatic test shall be conducted at a pressure of a minimum of 150 percent of the normal operating pressure of the force main 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 allowed, 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. 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 AUTHORITY. 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.

F. Repair and Retest: When any section of sewer fails to meet test requirements specified previously, the CONTRACTOR shall immediately:

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(s) required to demonstrate that sewer line meets specified test requirements.

G. The AUTHORITY reserves the right to retest at its own expense, any piping installed within the duration of the Construction Period.

1. CONTRACTOR shall make repairs of any work to piping found defective by any AUTHORITY conducted tests. Take cost of said repairs including restoration and AUTHORITY’s cost to perform test shall be solely at the CONTRACTOR’s expense.

Table 1 Minimum Specified Time Requirement for a 0.5 psig Pressure Drop for Size and Length of Pipe

Pipe Diameter In.	Minimum Time min:s	Length (L) For Minimum Time ft.	Time for Longer Length S/L	Specification Time for Length (L) Shown, min:s							
				100 ft.	150 ft.	200 ft.	250 ft.	300 ft.	350 ft.	400 ft.	450 ft.
4	1:53	597	0.190/L	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53
6	2:50	398	0.427/L	2:50	2:50	2:50	2:50	2:50	2:50	2:51	3:12
8	3:47	298	0.760/L	3:47	3:47	3:47	3:47	3:48	4:26	5:04	5:42
10	4:43	239	1.187/L	4:43	4:43	4:43	4:57	5:56	6:55	7:54	8:54
12	5:40	199	1.709/L	5:40	5:40	5:42	7:08	8:33	9:58	11:24	12:50
15	7:05	159	2.671/L	7:05	7:05	8:54	11:08	13:21	15:35	17:48	20:02
18	8:30	133	3.846/L	8:30	9:37	12:49	16:01	19:14	22:26	25:38	28:51
21	9:55	114	5.235/L	9:55	13:05	17:27	21:49	26:11	30:32	34:54	39:16
24	11:20	99	6.837/L	11:24	17:57	22:48	28:30	34:11	39:53	45:35	51:17
27	12:45	88	8.563/L	14:25	21:38	28:51	36:04	43:16	50:30	57:42	64:54
30	14:10	80	10.683/L	17:48	26:43	35:37	44:31	53:25	62:19	71:13	80:07
33	15:35	72	12.926/L	21:23	32:19	43:56	53:52	64:38	75:24	86:10	96:57
36	17:00	66	15.384/L	25:39	38:28	51:17	64:06	76:55	89:44	102:34	115:23

NOTE: Reprinted from ASTM 1417-92

End of Section

SECTION 02730

PIPED WASTEWATER SEWER

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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 Standard Details SD-005, SD-006, SD-007, SD-008, SD-009, and SD-010, for the details of construction. Manhole diameters shall be dictated by size of the installed sewer or an inside drop type connection.

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.

4. Manhole Diameter is dependent on the specific application. MTMA Standard manhole diameter is 48″ for manholes up to 20′ depth; beyond 20′ depth a 60″ Ø manholes is required. Also for

inside drop connections and sewers greater than 18″ diameter a 60″ manhole is required.

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 manufacturers.

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 Standard Detail SD-013. Frames and covers shall be NEENAH R-1753 with self sealing lids. The covers shall have lettering identifying the "MTMA SANITARY" and 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 Standard Detail SD-014. 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 1-inch lettering identifying the "MTMA SANITARY".

3. Security Bolted Manhole Frames and Covers shall be East Jordan Iron Works 1890Z1/1890A2GS or an approved equal. Frame and cover shall conform to Standard Detail SD-015. The covers shall have 1-inch lettering identifying the “MTMA SANITARY”.

E. PIPE CONNECTIONS

1. Sanitary sewer pipe connections shall be watertight flexible boots with stainless steel bands as manufactured by A-Lok or approved equal for pre-cast manhole connections. Link-Seal connectors with stainless steel bolts and nuts as manufactured by Thunderline Corporation or an expandable boot with stainless steel bands as manufactured by Press-Seal Gasket Corporation may be used for core-drilled connections. See Standard Detail SD-018 for Precast Base and SD-019 for cast-in-place base.

F. LADDER BARS

1. Ladder bars shall be fourteen (14) inches wide on twelve inch centers cast in the manhole wall at the time that the concrete barrel section is made; steps shall project 8 ½-inches into the barrel section; steps shall be reinforced plastic step: composed of No. 3 grade 60, ASTM A 615 deformed steel reinforcing bar completely encapsulated in Grade 49108, ASTM D 4104 Polypropylene Copolymer Compound, Type II; MA Industries Inc. or equal.

G. 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.

H. 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. Two layers shall be used on manhole joints and under grade rings.

I. Manhole Inside Drop Connection: Make drop connections where indicated on the contract drawing where the drop in invert is two feet or more above the bottom of manhole.

1. Inside Drop shall only be used where pre-approved and where the inlet sewer pipe slope is less than 10 percent.

2. Pipe material shall match specified sewer main pipe material.

3. Construct inside drop connection in accordance with Standard Detail SD-006.

4. Inside Drop Pipe shall be anchored to the inside face of the manhole barrel at the tee connection and maximum four feet on centers along the Drop Pipe.

5. Tee shall have installed a cleanout access.

6. Inside drop connection shall have installed a 45 degree bend supported with concrete at the manhole invert.

7. All pipe anchor materials shall be 316 stainless steel.

J. Manhole Outside Drop Connection: Make drop connection where indicated on the Contract Drawings and where the drop in invert is two feet or more above the manhole bottom.

1. Pipe material shall match the specified sewer pipe material.

2. Construct outside Drop Connection in accordance with Standard Detail SD-005.

K. MANHOLE LINER

Manholes receiving flow from a pressure sewer and/or when required by the AUTHORITY 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.

1. 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.

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

3. 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.

4. 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.

5. There shall be no ladder bars in manholes having a plastic liner. See Standard Detail SD-011.

L. INFLOW PROTECTORS:

1. The CONTRACTOR shall furnish and install plastic inflow protectors at all manholes as required by the AUTHORITY. 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. They shall be similar to Standard Detail SD-016 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. The flexible Butyl Resin Sealant shall be provided on both upper and lower sections of joint.

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) 7/8 - 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. 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 of the same size as previously specified. The design shall provide for full bearing of manhole cover frame. A maximum depth of 12-inches of grade rings will be permitted for full bearing of manhole cover frame. A maximum depth of 12-inches of grade rings will be permitted for adjustment of the manhole frame to grade. Where grade adjustments exceeding 12-inches an additional riser section shall be installed below the cone section. All grade adjustments must be conducted under the inspection of an AUTHORITY representative. Vacuum testing is required after grade adjustments are complete.

2.03 OPTIONS IN PRODUCTS

A. Manhole Construction Options:

1. All precast reinforced concrete manhole components.

2. All precast reinforced concrete manhole components except manhole base. Base of cast-in-place concrete construction may be permitted for connections to existing sanitary sewers subject to approval by the AUTHORITY.

a. 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 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.

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 AUTHORITY.

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 AUTHORITY.

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

a. Set doghouse base on solid blocks to correct grade and pour concrete base, forming the invert to suit the flow pattern.

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.

c. 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. 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 the interior 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.

10. The minimum depth flow channel shall be equal to ¾ of the diameter of the largest sewer in the manhole to which it connects. The channel shall be graded to give a smooth, uninterrupted flow through the manhole.

11. Bench walls shall be pitched a minimum of 1-inch per foot from the inside periphery of the manhole to the edge of the flow channel.

12. Pipe shall be extended 3-inches beyond the manhole wall and the pipe shall be provided a monolithically formed concrete doghouse around the entire periphery of the pipe.

D. 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 two layers of flexible butyl resin between joints in accordance with the manufacturer's recommendations, one on the top and one on the lower joint.

E. Frame and Cover Installation: Where required, make final adjustment of frame to elevation using the following materials:

1. Set precast grade rings with flexible butyl resin where grade is reasonably level.

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. Brick Leveling Units: Brick Riser sections are NOT permitted.

4. Bolt manhole frames with four bolts 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.

5. Use stainless steel all-thread 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

through manhole frame to properly tighten nut and washer.

F. Plugging Pipe Openings: Plugged pipe openings in manholes where such openings are required for future pipe connections shall be installed with SDR 35 PVC cap into flexible boot secured with stainless steel band. Install such materials to meet exfiltration limits and to allow future removal without damage to manhole.

G. Drop Manholes: Construct in accordance with Type indicated in Standard Details and as directed by the AUTHORITY. Use ductile iron pipe and fittings in outside drop connection. If a transition is necessary to change the pipe material from PVC to ductile iron prior, this transition shall be completed with a mechanical joint solid sleeve with transition gaskets one full joint of pipe from the drop connection.

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, and checked for proper grade.

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

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 AUTHORITY'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 AUTHORITY. 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 AUTHORITY’s approval prior to use.

3. Make repairs, replacements and retests at CONTRACTOR’s expense.

End of Section

SECTION 02731

MANHOLES

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SECTION 02732

MANHOLE VAULTS

PART 1: GENERAL

1.01 Vaults shall be precast concrete manholes having a diameter of five feet. Structures shall house air and vacuum relief valves, small diameter force main clean out ports, and misc. valves. Vaults shall conform to Standard Detail SD-034.

1.02 RELATED WORK

A. Excavation, Backfill and Completion Section 02220.
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 02731 for watertight manhole frames and covers.

B. Precast Concrete Producer Qualifications: Provide documentation from the precast concrete chamber unit producer that their products have been in continuous service for five years minimum.

1. Provide documentation that the chamber units are designed to meet the minimum structural loading requirements of ACI-318. (Use for non-vehicular traffic).

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.

SECTION 02732

MANHOLE VAULTS

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 C-478 and shall include barrel sections, flat top and precast extended base. Upon prior written approval of the AUTHORITY, the CONTRACTOR can install a cast in place base.

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

C. Water Tight Manhole Frames and Covers: As specified in Section 02731.

D. Manhole Steps: Design as indicated on Drawings for Poured in Place Concrete Walls.

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 II; M. A. Industries, Inc. or equal.

F. 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.

G. Grout: As specified in Section 03600.
   1. Non-shrink non-metallic grout.

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

I. 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.

J. 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.

K. 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 02731.

PART 3: EXECUTION

3.01 VAULT CONSTRUCTION METHODS

A. Precast Concrete Chamber 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. Install two layers of sealant per joint.

B. Manhole Steps and Frame and Cover Installation: As specified in Section 02731.

C. Install DIP U-vents with stainless steel insect screen on all valve vaults.

D. U-vents shall be painted with an approved coating green in color.

E. All piping connections inside the valve vault shall be made using stainless steel hardware.

End of Section

SECTION 02733

SMALL DIAMETER

PRESSURE SEWER CLEAN OUT

PART 1: GENERAL

At location identified in the contract drawing small diameter pressure sewers shall have installed an end of line or in line cleanout port (see Standard Details SD-036 and SD-037). The clean out shall be installed in a precast concrete Manhole Vault as specific in Section 02732.

PART 2: PRODUCTS

All pipe within the meter box shall be schedule 80 PVC with neoprene insulation. For in-line flushing connections on 2-inch force mains, the flushing connection shall be preceded and followed by a ball valve provided with a valve box 4 ¼ - inch or 4 ½ - inch in diameter. Where the force main is 3-inch diameter or larger, an in-line flushing connection shall be preceded and followed by a mechanical joint resilient seat gate valve and 5 ¼ - inch valve box assembly of 3 piece construction. Lids of the meter box and valve box assemblies shall be labeled “SEWER”. The flushing connection shall be supplied with a 1 ½-inch ball valve with FPT x FPT ends, stainless steel ball and stainless steel handle; 1 ½ - inch brass nipple and collar, and a schedule 80 PVC Plug MIP. The meter box shall be set on a minimum of 6-inches of compacted 2-B stone bedding. The fittings on the force main preceding the flushing connection shall be secured with concrete thrust blocking as previously specified.

PART 3: EXECUTION

Not Used.

End of Section

SECTION 02733

SMALL DIAMETER

PRESSURE SEWER CLEAN OUT

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SECTION 02900

LANDSCAPING

PART 1: GENERAL

1.01 WORK INCLUDED

The CONTRACTOR shall provide all material, labor, plant, utilities and services required to provide Site Landscaping.

PART 2: MATERIAL

2.01 All materials shall conform to the current edition of "American Standard for Nursery Stock" (ASNS), ANSI, Z60.1 of the AAN and as follows:

(NAME PLANTS AND QUANTITY)

2.02 PLANT STOCK

A. Plant stock shall meet the following requirements.

1. True to type and name, in accordance with the current edition of Standard Plant Names, American Joint Committee on Horticulture Nomenclature;

2. Each bundle or each plant, if not bundled, labeled with not less than the plant's common name and size;

3. Typical of species or variety indicated;

4. Free from disease and injurious insects, in accordance with state and federal laws;

5. Free from mechanical injuries, cutback leaders, broken branches, decay or other defects;

6. Unless otherwise designated, nursery-grown plants, acclimated to State soil and climatic conditions; and

7. Dormant, other than those specified as container grown.

2.03 NURSERY STOCK

A. Nursery stock shall be grown in a certified nursery for a period of at least two full growing seasons. The use of mechanical digging equipment at the nursery will be permitted only when its use is not detrimental to nursery stock survival.

2.04 BALLED AND BURLAPPED (B&B) PLANTS

1. Firmly ball with the original and undisturbed soil in which the plant was growing.

2. Wrap with untreated, biodegradable burlap or similar acceptable material, then tightly lace with biodegradable lacing to hold ball firm and intact.

3. Plants delivered to the planting site with balls broken, loose or manufactured will be rejected.

4. Acceptable nursery trade root protection devices will be permitted in lieu of burlapping, as approved.

2.05 CONTAINER-GROWN PLANTS

A. Container grown plants shall be grown for at least one year, but not more than two years, in the same container. Only ground cover plants will be accepted with roots in a “pot-bound” condition.

2.06 INSPECTION AND REJECTION

Plant materials shall be inspected at the project planting site prior to planting.

Inspection at the project site is to insure that plant stock is from an approved source, are in healthy and undamaged condition, conform to size, type and quantities and appropriate ANSI Z60.1 standards.

Plants exhibiting the following defects or damage may be rejected:

1. Decay. Evidence of decayed tissue on plant trunk, branches or twigs.

2. Sunscald or sunburn. Cambium tissue or bark damage.

3. Mechanical damage/bark abrasions. Damage to cambium tissue.

4. Frost cracks. Splits in bark or wood.

5. Disease. Evidence of abnormal growth of leaves, twigs, fruit, bark, discoloration of leaves and bark or sap discharge.

6. Insect damage. Evidence of borer holes into bark or wood or insect eggs or larvae.

7. Other damage or injury. Evidence of branch and twig die-back, dry buds or dead leaves.

8. Improper pruning. Evidence of improper stubs left on trunk, branches or twigs or removal of excessive branches which will leave the plant asymmetrical or non-uniform in plant density.

9. Girdling roots. Evidence of roots growing in a damaging, encircling configuration.

10. Improper habit of growth. Non-standard growth patterns for single or multiple stem plants, non-typical for their plant genus, species or varieties.

11. Sheared plants. Sheared evergreen trees or shrubs not representative of full foliaged, natural growth plants.

Plants damaged during planting operations will also be rejected and require replacement with appropriate specified plants.

Segregate and remove rejected plants from the planting site within 48 hours or as directed.

2.07 SUBSTITUTIONS

No substitutions will be permitted without authorization, or prior approval by the AUTHORITY ENGINEER.

2.08 SHIPMENT

A. Carefully pack the roots of bare-rooted stock in spaghnum moss, moist straw, or other suitable material that will ensure the plant's arrival in acceptable condition. For material shipped in open vehicles, cover with securely fastened canvas, burlap or other material to prevent wind burn or drying. Plant material which has heated or "sweated" by reason of tight packing or poor ventilation will be rejected. For plants shipped during the active growing season, strip leaves and treat plants with antidesiccant and /or antitranspirant, applied by spraying or dipping, to prevent transpiration. Comply with local, State and Federal laws relative to plant material shipment.

2.09 FERTILIZER

A. Mulch and backfill mix for planting in accordance with the standard details.

B. Peat to two parts topsoil by volume.

2.10 SOIL AMENDMENTS

A. Peat Shredded reedsedge peat or spaghnum moss peat, or a combination of both, from fresh water sites. Do not use peats in an advanced stage of decay.

2.11 STAKES AND TIE ATTACHMENTS

A. As shown on the Standard Drawings and meeting the following requirements:

1. Wood Stakes Rough-sawn, Red or White Cedar, Southern Yellow Pine, or acceptable hardwoods. Provide stakes free from knots, rot, or other defects that impair strength or render them unfit for the intended purpose.

2. Rubber Tie A wide flexible rubber strip ranging in width from 40 mm (1 ½ inches) to 75 mm (3 inches) with minimum length ranging from 350 mm (14 inches) to 480 mm (19 inches) made from recycled tire inner tube with a brass plated grommet (minimum diameter of 13 mm (1/2-inch)) on each end.

3. Fiber Tie A photodegradable, high tenacity, low abrasion, flat synthetic fiber woven into a tape 20 mm (3/4-inch) wide with a break strength of at least 408 kg (900 lbs.).

4. Wire 3.30mm^2 (No. 12 gage), galvanized, in accordance with ASTM A 392, Class II.

2.12 TREE PROTECTORS

A. As shown on the Standard Drawings. Round or rectangular metal devices manufactured from 1.31 mm (No. 18 gage), 1.01 mm (No. 20 gage), or 0.70 mm (No. 24 gage) thick galvanized steel, or aluminum, with 14 mm (9/16-inch) or 16 mm (5/8-inch) diameter perforations.

B. In nonmowed areas, use suitable plastic or 13 mm (1/2-inch) hardware cloth devices for protection against rodent damage. Before placing, submit samples or manufacturer’s catalog cuts of the devices, for review and acceptance.

2.13 MULCHING

A. Where indicated, mulch the entire plant pit or other area as indicated.

PART 3: CONSTRUCTION

3.01 TEMPORARY STORAGE

Heel-in or properly store planting stock, if not planted immediately. Provide, prepare, and obtain acceptance of a suitable heeling-in site or arrange for a well-ventilated and cool storage shed, located near the planting site.

If not planted immediately, temporarily store container grown or balled and burlapped plants, in a protected area, with containers or balls 150 mm (6 inches) apart.

Use moist mulch and fill voids up to the top of the container or ball.

As soon as bare root plant material arrives at the project, remove from the transport truck, then cover the roots with wet burlap or mulch to prevent drying. Protect the plants from the sun and wind and keep fresh by fine mist spraying, or by other acceptable methods.

Protect plants at all times. Plants will be rejected if left out of the ground unprotected overnight; left with roots exposed to wind or sun; or left improperly protected during transit, unloading, storage, heeling-in, or during the planting operation.

3.02 LAYOUT OF PLANTINGS

As indicated, delineate the plant pit locations, plant bed and planting area outlines. Identify the plants to be placed at the delineated location. Do not start excavation or cultivation until the locations and outlines have been accepted.

Should rocks or other obstructions prevent planting at indicated location, alternate locations or deletions will be determined by the AUTHORITY.

3.03 PREPARATION OF PLANT PITS

For bare-root shrubs, vines and seedling transplants, dig pits with vertical sides and with flat bottoms large enough to accommodate the roots without crowding. Allow for the placing of at least 150 mm (6 inches) (300 mm (12 inches) for deciduous trees) of backfill mix on all sides of the root system. For common periwinkle, pachysandra, and ivy, provide only 100 mm (4 inches) of backfill mix beneath and around all sides of the root system.

Dig pits for materials designated balled and burlapped or bare root, prior to removing the plants from temporary storage. Satisfactorily scarify, loosen, or roughen the sides of glazed or hardened surfaces in the dug pits, immediately before planting.

When soil conditions are unfavorable to plant growth or when directed, dig the pits up to three times the root spread or ball width.

Schedule digging operations, particularly on slopes, so actual planting operations occur within a period of not more than 1 week, unless a delay is permitted by the AUTHORITY and the Allegheny County Conservation District.

3.04 PRUNING

Prune any dead, dying, broken or any undesirable branches not adequately pruned at the nursery prior to delivery. Prune according to best horticultural practice for the health of the plant and the natural or designed form and growth characteristics of the individual species.
For pruning damaged or broken main roots, cut immediately above the damage with a clean, oblique cut.

3.05 TRANSPLANTING EXISTING PLANTS

Relocate plant material designated for transplanting to areas indicated. Move plants while dormant unless otherwise approved.

Apply an approved antidesiccant/antitranspirant, in accordance with the manufacturer's application recommendations, to all evergreen plant material and any deciduous trees or shrubs in leaf prior to digging.

Dig plants with root balls of sufficient diameter and depth to encompass enough fibrous and feeding roots for the full recovery of the plant. Root ball sizes and depths to correspond to the next largest size nursery grown stock listed in the AAN Standard for deciduous and evergreen trees and shrubs. Dig root ball to have a flat bottom. Keep roots protected and moist at all times during transplanting procedures. Ball and burlap roots using tightly sewn, untreated, biodegradable burlap laced with heavy twine in accordance with Section 808.2(a) 3. and approved nursery industry practices.

Prune any damaged, broken, or diseased main roots in accordance with Section 808.3(e) 2.

Carefully transport plant to transplant site as soon as possible after digging. Handle plants only by the root ball. Pad trunks and major branches to prevent damage from construction equipment.

Replant, prune, water, and maintain transplanted material in the same manner as new stock.

Locate and prepare an acceptable, secured, temporary site for heeling in or above ground storage of all plants which cannot be immediately replanted at their designated transplant site due to construction sequencing. Follow section 808.3(a) guidelines. Periodically water all root balls during the storage period as directed.

3.06 PLANTING

Plant when soil and climatic conditions are favorable, according to the following schedule:

- o Deciduous Trees and Shrubs: October 15 to November 30 and April 1 to May 15
- o Evergreen Trees and Crownvetch plants: March 1 to May 15 and August 1 to September 15
- o Seedlings and Seedling Transplants: March 1 to May 15
- o Rhizomes, Bulbs, Tubers, and Starter Plants: March 1 to May 15
- o Pugs and Peat Pots: March 1 to September 15

Where local conditions warrant, these dates may be extended, if directed in writing by the District Engineer.

3.07 PLACING PLANTS

Set plants plumb and at the required depth. For balled and burlapped plants and for materials in containers, handle by the ball or packaging material, not by the stem or branches. Cut or untie root ball compressed roots around the edges of the root mass and spread roots outward in the planting hole prior to backfilling. Set bare root plants over a compacted raised mound in the planting hole. Spread and evenly distribute roots over the mound prior to backfilling.

Plant bare-roots plants immediately. To prevent root drying, cover roots with wet burlap, straw, hay, or other protective measures.

3.08 FERTILIZING AND BACKFILLING

Fertilize, in accordance with fertilizer schedule and as detailed. Mix the specified quantity of water absorbent granules into the backfill material spread around the plant roots in the bottom half of the planting hole. Use 15 g (0.5 ounce) of water absorbent polymer granules for each 100 mm (4-inch) width of root ball for shrubs and 60 g (2 Ounces) for each 25 mm (1-inch) caliper of trees. Cultivate and completely tamp backfill mix around the ball or roots, in a manner that fills voids and eliminates air pockets. Avoid breaking or damaging roots during backfilling and tamping operations. When backfilling

is two-thirds complete, lay back or cut off and remove the top one-third of the root ball wrapping material on balled and burlapped plants. Cut off and remove any wire root protection devices from the top one-third of the root ball. Thoroughly water the backfill material around the roots. After the water has been completely absorbed, complete backfilling and broadcast mycorrhizal fungi packet(s) around the perimeter of the root ball and incorporate into the top 250 mm (10 inches) of the backfill mix and thoroughly water. Firm backfill material around the top of the planting hole and plant stem. Fill in any surface irregularities of the planting hole and level soil. Apply 1 fungi packet for each 25 mm (1 inch) of tree caliper measured 150 mm (6 inches) above the top of the root ball. Fungi application is not required for shrub or ground cover plants.

Do not expose fungi packets to direct sunlight until ready to use at the planting pit.

Provide documentation of delivery to planting site of approved fertilizer(s) and fungi product. Certify that fertilizer and fungi requirements were installed as specified.

3.09 STAKING

Stake trees using either rubber or fiber ties immediately after completion of the backfilling operation of the tree pit as indicated on the Standard Drawing and as follows.

3.10 RUBBER TIE

Use size of tie indicated on the Standard drawing for the appropriate tree caliper size. Wrap tie(s) around the tree trunk so that the rubber strip lies flat against the trunk. Securely fasten tie ends to stake with approved wire run through the grommet hole at each end of the tie and wrapped and tightened around the stake at a point approximately 50 mm (2 inches) from the top of the stake.

3.11 FIBER TIE

Wrap tie around the tree trunk so that the fiber material lies flat against the trunk in the knot configuration recommended by the tie manufacturer. Fasten the tie end to each stake by securely tying the tie around the stake.

3.12 PLACING TREE PROTECTORS

Use metal tree protectors around the base of deciduous and flowering trees, with the bottom of the protector extending through the mulch and in contact with the backfill material. On evergreen, multi-stem, and specific flowering trees, place protectors only if removal of branches and other cutting is not required. Fasten protectors together with galvanized “hog rings,” using two rings for the first 600 mm (24 inches) and an additional ring for each additional 300 mm (12 inches) of height, or by using other acceptable fabrication methods. When multi-segments are used, securely fasten pieces together with rivets or grommets entirely around the connection so that a rigid single-piece section is constructed.

Install plastic tree protectors in the manner recommended by the manufacturer.

PART 4: PERIOD OF ESTABLISHMENT

4.01 Maintain all plants, in a living, healthy condition until the entire project has been accepted. Plants are required to have been growing in place at least 30 days prior to project acceptance. During this period of establishment, perform the necessary watering, weeding applying of acceptable insecticides or fungicides, cultivating, remulching to maintain a depth of 75 mm (3 inches) and adjusting ties and stakes, all as required or directed.

4.02 WATERING

Water during the period of establishment as directed. Perform watering promptly with sufficient personnel

and equipment to complete the watering requirements within 5 calendar days after having been directed. Apply water, by open-end hose, by gravity or low-pressure pump (not more than 70 kPa (10 psi)). Allow water to percolate into the soil without run-off. Furnish measurements and capacities of water tanks to be used in this operation. Submit source of water and watering schedule for acceptance.

4.03 CLEAN-UP

Satisfactorily remove and dispose of subsoil, rock debris and other undesirable planting excavation materials from the planting site. Leave planting sites in an acceptable condition. An acceptable condition may include seeding with Formulas B, D, or L and mulching with hay or straw, at rates typical for the affected areas.

PLANT REPLACEMENTS

4.04 NURSERY STOCK

Within 30 days from the time directed by the owner’s representative in writing, and prior to acceptance of the entire project, replace plants and trees not alive and healthy with plants of the same species, size, and quality as originally indicated and specified. The ENGINEER will determine plants that are not acceptable. If directed, make replacements at the beginning of the planting season, or, if agreed upon in writing, the unacceptable material will be deleted from the contract. At the time of final inspection, only living, healthy plants will be accepted.

4.05 TRANSPLANTED MATERIAL

Replace any dead or unhealthy transplanted material with approved nursery grown plants of the same species and general size prior to final acceptance of the project. If directed, make replacements at the beginning of the next planting season.

4.06 MULCHING

Where indicated, mulch the entire plant pit or other area as indicated.

PART 5: EXECUTION

Not Used.

End of Section

SECTION 02900

LANDSCAPING

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SECTION 02910

SOIL TREATMENT

PART 1: GENERAL

Not Used.

PART 2: PRODUCTS

Not Used.

PART 3: EXECUTION

3.01 FINAL GRADING

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.

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

The CONTRACTOR shall obtain topsoil from a local garden supplier or nurseryman for locations where existing topsoil is not of adequate quantity and quality.

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

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:

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.

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.

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 the expiration of the eighteen month maintenance period.

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 AUTHORITY. Mulching material shall be in accordance with the recommendation of a local recognized nurseryman approved by the AUTHORITY.

End of Section

SECTION 02910

SOIL TREATMENT

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SECTION 02959

TELEVISION INSPECTION

PART 1: GENERAL

1.01 SUMMARY

A. Section includes internal closed circuit television (CCTV) inspection of sewers and manholes.

1. Inspect sewers and manholes using color CCTV camera and document inspection on video with audio location and date information, video title information and continuous tape counter. Provide hard copy of inspection logs.

2. The camera, a television monitor and other components of the video system shall be capable of producing color picture quality to the satisfaction of the AUTHORITY.

3. Schedule CCTV inspection with the AUTHORITY.

1.02 RELATED SECTION

A. Section 02080 Bypassing Sewage

1.03 SUBMITTALS

A. Inspection Logs: Unless otherwise indicated, submit inspection logs that include the following as a minimum:

1. Project title
2. Time of day
3. Manhole to manhole pipe section
4. Pipe segment length
5. Pipe material
6. Line size
7. Compass direction of viewing
8. Direction of camera’s travel
9. Pipe depth
10. Operator name

11. Tape counter reading at beginning and end of each manhole to manhole pipe segment.

12. Points of infiltration

13. Locations of Building Sewers

14. Unusual conditions, roots, storm sewer connections, broken pipe, presence of scale and corrosion and other discernable features.

B. Video record: Submit completed video record after cleaning and rehabilitation.

C. Maintain copy of all inspection documentation (recordings, databases, and logs) for duration of Work and warranty period.

PART 2: PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Video record: shall be color DVD format.

1. Audio portion of composite video record shall be sufficiently free from electrical interference and background noise to provide complete intelligibility of oral report.

2. Store in upright position with temperature range of 45 to 80 degrees F (7 to 27 degrees C).

3. Identify each DVD with labels showing Contract Number, AUTHORITY'S name, CONTRACTOR's name, and each manhole-to-manhole pipe segment of sewer line represented on DVD.

B. Television Inspection Camera(s): Equipped with rotating head, capable of 90-degree rotation from horizontal and 360-degree rotation about its centerline.

1. Minimum Camera Resolution: 400 vertical lines and 460 horizontal lines.

2. Camera Lens: Not less than 140 degree viewing angle, with automatic or remote focus and iris controls.

3. Focal Distance: Adjustable through range of 6 inches (152 mm) to infinity.

4. Camera(s) shall be intrinsically safe and operative in 100 percent humidity conditions.

5. Lighting Intensity: Remote-controlled and adjusted to minimize reflective glare.

6. Lighting and Camera Quality: Provide clear, in-focus picture of entire inside periphery of sewer.

C. Footage Counter: Measures distance traveled by camera in sewer, accurate to plus or minus 2 feet (0.6 m) in 1,000 feet (305 m).

PART 3: EXECUTION

3.01 SEWER FLOW REQUIREMENTS

A. Do not exceed depth of flow shown on Table 1 for respective pipe sizes as measured in manhole when performing CCTV inspection.

B. When depth of flow at upstream manhole of sewer line section being worked is above maximum allowable for CCTV inspection, reduce flow to level shown in Table by pumping and bypassing of flow as specified in Section 02080.

TABLE 1
MAXIMUM DEPTH OF FLOW FOR TV INSPECTION

Nominal Pipe Diameter	Maximum Depth of Flow
6″ – 10″	20 percent of pipe diameter
12″ – 24″	25 percent of pipe diameter

3.02 SEQUENCE OF WORK

Perform Work in the following sequence:

A. Clean sewer lines and manholes prior to CCTV Inspection.

B. Perform CCTV inspection to comply with requirements of this specification.

C. Repeat TV inspection in same direction as previous inspection, after completing repairs and or defects.

3.03 INSPECTION REQUIREMENTS

A. Access: AUTHORITY shall have access to observe monitor and other operations at all times.

B. Video Commentary: Record the following information on audio track of video inspection record: narrative of location, direction of view, manhole numbers, pipe diameter and material, date, time of inspection, and location of laterals and other key features.

1. Video record shall visually display this information at beginning and end of each manhole-to-manhole pipe segment.

2. Video record between manholes visually display length in feet from starting point of given segment.

a. The importance of accurate distance measurements and determining the exact location of service connections is emphasized. Measurement for location of defects shall be above ground by means of a meter device. Marking on the cable, or the like, which would require interpolation for depth of manhole, will not be allowed. Accuracy of the distance meter shall be checked by use of a walking meter, roll-a-tape, or other suitable device, and the accuracy shall be satisfactory to the AUTHORITY. Any section of gravity sewer which is found by internal TV inspection to be defective, contain silt and/or debris, or be otherwise unacceptable to the AUTHORITY,

shall be corrected and re-televised, at the cost of the CONTRACTOR.

C. Sewer Identification: Video record and inspection documentation shall include sewer line and manhole identifiers shown on Drawings. After installation of sewer pipe liners, use upstream manhole as identifier in conjunction with distance meter.

D. Image Perspective: Camera image shall be down center axis of pipe when camera is in motion.

1. Provide 360-degree sweep of pipe interior at points of interest, to more fully document existing condition of sewer.

2. Points of interest may include, but are not limited to the following: defects, encrustations, mineral deposits, debris, sediment, and any location determined not to be clean or part of proper liner installation, and defects in liner that include, but are not limited to bumps, folds, tears, and dimples.

3. Cabling system employed to transport camera and transmit its signal shall not obstruct camera’s view.

E. Sewer Reach Length: Physically measure and record length of each sewer reach from centerline of its terminal manholes.

F. Inspection Rate: Camera shall be pulled through sewer in either direction, but both inspections are to be in same direction. Maximum rate of travel shall be 30 feet (9 m) per minute when recording.

3.04 FIELD QUALITY CONTROL

A. AUTHORITY will review video records and logs to ensure compliance with requirements listed in this specification.

B. If sewer line, in sole opinion of AUTHORITY'S, is not adequately clean, it shall be recleaned and CCTV-inspected by CONTRACTOR at his own expense.

End of Section

SECTION 03010

CONCRETE WORK

DIVISION 3 - CONCRETE

PART 1: GENERAL

1.01 WORK INCLUDED

The CONTRACTOR shall furnish all material, equipment, labor, services, etc., to complete and install all concrete work as specified and/or as indicated on the approved construction drawings.

All concrete, grout and all ingredients including water shall be as approved by the concrete supplier.

The AUTHORITY will designate an independent commercial testing laboratory to do all the making and testing of concrete cylinders. The cost of the testing laboratory shall be paid by the OWNER.

The CONTRACTOR shall notify the independent commercial testing laboratory designated by the AUTHORITY at least 24 hours in advance of each concrete pour and no concrete shall be placed until the design mix, shop drawings and reinforcement have been approved.

During progress of construction the preparation and testing of cylinders shall be conducted by the designated laboratory to determine whether the concrete being produced complies with the specifications.

The CONTRACTOR shall make provision for the installation and casting into the concrete of all sleeves, anchor bolts, equipment supports, conduit, frames, drains, curb angles or other appurtenances indicated on the drawings or described herein. All anchor bolts shall be installed in substantial accord with the details shown on the drawings.

All piping, equipment and appurtenances supported by concrete foundations shall be installed with said foundations securely doweled to floors in such a manner as to prevent disturbance from vibration. The size of the foundation shall be dependent on the respective equipment. For foundations projecting 6 inches or more above the floor, dowels shall consist of one (1) No. 6 bar per square

foot of foundation unless otherwise recommended by the equipment manufacturer.

The final setting, grouting and alignments of all equipment shall be done by qualified and experienced personnel in strict conformity with the respective manufacturer's recommendations.

1.02 SPECIAL CONDITIONS

Any change in configuration or design of the concrete foundations and/or structural elements which is required to accommodate any construction procedure or operation shall be done only on approval of the AUTHORITY, and at the CONTRACTOR's expense. The CONTRACTOR shall accompany any request for a design change, with calculations prepared by a qualified registered professional engineer which shall show the effect of the proposed changes on the elements to be revised and on all supporting elements.

If directed by the AUTHORITY, in lieu of the testing lab making slump test, a slump test shall be made by the CONTRACTOR in the presence of and under the supervision of the AUTHORITY's representative at the site.

When construction joints are indicated on the drawings, they are located to permit free shrinkage of the concrete back to restrained "L" or "T" joints. These construction joints shall not be relocated without the approval of the AUTHORITY.

The CONTRACTOR shall show the location of all construction joints on the reinforcing supplier's submitted drawings. Any change in location or any deviation from the requirements indicated on the drawings or in the specifications will be considered for approval at that time if so requested by the CONTRACTOR.

1.03 INSTRUCTIONS FOR LAB TESTING OF CONCRETE

A. General

This work is intended to cover all phases of concrete control, testing and inspection necessary to assure an in-place concrete of high structural quality and

durability. The concrete to be used in this project shall be ready-mixed concrete in conformity with ASTM Designation C94 (latest revision) except as revised or amended hereinafter.

B. Preparation of Field Specimens

During the progress of construction, tests shall be made by the testing laboratory to determine whether the concrete being produced complies with the standards of quality specified.

A set of concrete field specimens shall consist of three 6" diameter x 12" long cylinders made and cured by the testing laboratory representative in accordance with Method of Making and Curing Concrete Compression and Flexure Test Specimens in the Field, ASTM Designation C31. Concrete shall be sampled in the field for each day's pour as follows:

1. 2 sets of first 25 cy or fraction thereof except as stated hereinafter

2. 1 set for each additional 50 cy or fraction thereof after the first 25 cy

3. 1 set for structural placements under 10 cy in one day

4. A minimum of 3 sets for pours greater than 25 cy (total required)

All cylinders shall be tagged numerically, such tag indicating date of pour, exact location in the work at which each load represented by the cylinders is located and the delivery ticket number of the load from which the specimen was made.

The AUTHORITY reserves the right to alter the number of cylinders made and/or broken from that shown in the preceding paragraphs.

C. Testing of Field Specimens

Testing of each set of concrete cylinders shall be accomplished in accordance with Standard Method of Tests, ASTM Specification Designation C39.

1. 1 cylinder of each set at age 7 days
2. 1 cylinder of each set age 28 days
3. 1 cylinder of each set at the direction of the AUTHORITY

PART 2: PRODUCTS

A. Not Used.

PART 3: EXECUTION

A. Not Used.

End of Section

SECTION 03100

CONCRETE FORMWORK

PART 1: GENERAL

1.01 WORK INCLUDED

All formwork shall be as required in "Recommended Practice for Concrete Formwork" (ACI 347), except as revised or modified hereafter.

Forms shall conform to the shape, lines, grades and dimensions of the concrete as called for on the drawings. All lumber used for forms shall be thoroughly cleaned and treated with an approved form oil. Lumber used in forms for exposed surfaces shall be dressed to a uniform thickness and shall be free from loose knots or other defects. For unexposed surfaces and rough work, undressed lumber, free of nails and clean of hardened concrete or other foreign material may be used. Lumber once used in forms shall have nails withdrawn, and surfaces to be in contact with concrete shall be thoroughly cleaned before being used again. Forms for all exposed concrete shall be carefully built to produce the contour and design indicated. Care shall be taken to assure that all form joints are truly vertical or horizontal. No sloping joints will be accepted.

Form sheathing for exposed surfaces may be composed of tongue and groove lumber, shiplap, plywood, concrete form board, or steel. Steel lining on wood lagging will not be permitted. Tongue and groove shiplap when used shall conform to the American Lumber Standards for No. 2 boards. Plywood used for sheathing or lining shall be Grade B-B, exterior or better, as described in the Commercial Standards of the Douglas Fir Plywood Association. The forms used shall produce a concrete surface with "abrupt" irregularities less than 1/4-inch and gradual irregularities less than 1/2-inch in 5 feet.

Forms shall be sufficiently tight to prevent leakage of mortar. They shall be properly braced or tied together so as to maintain the desired position and shape during and after placing concrete and so they will not tremble or distort in a high wind.

Temporary openings shall be provided at the base of wall forms and at other points where necessary to facilitate cleaning and inspection immediately before depositing concrete.

Embedded metal rods of a design approved by the ENGINEER shall be used for internal form ties. They shall be so designed and arranged that when the forms are removed, no metal shall be within 3/4-inch of any concrete surface. The ties used shall be manufactured in such a way that installation will not necessitate a hole in the form larger than the tie rod.

No form or form support shall be removed from the formed surface for at least 24 hours. Forms shall be removed in such a manner as to insure the complete safety of the structure. Responsibility for the removal of forms shall be with the CONTRACTOR. However, the following minimum requirements shall be adhered to:

A. Forms shall not be removed until the concrete has attained 80% of the specified 28-day strength.

B. In cold or inclement weather the requirement for removal of forms shall be as stated in the Section 3300 under "Placing Concrete in Cold Weather".

C. Forms for supporting reinforced concrete roofs or floors shall not be removed nor form supports slackened for a period of 28 days unless the CONTRACTOR can produce satisfactory evidence that the concrete has attained the specified 28 day strength characteristic.

D. Portions of the structure which will be subject to construction loads or backfill shall have attained sufficient strength to withstand these loads and the CONTRACTOR may be required to produce evidence that such strength has been attained.

E. No construction loads exceeding the structural design loads shall be supported upon any unshored portion of the structure under construction. Evidence that the concrete has attained a strength sufficient for the

above conditions shall consist of reports of compression tests made on job cured cylinders. The cost of such tests shall be borne by the CONTRACTOR.

In case the CONTRACTOR shall remove any form or slacken any supports before the above conditions have been met, the concrete elements may be condemned even though there is no apparent defect.

PART 2: PRODUCTS

A. Not Used.

PART 3: EXECUTION

A. Not Used.

End of Section

SECTION 03100

CONCRETE FORMWORK

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SECTION 03200

CONCRETE REINFORCEMENT

PART 1: GENERAL

A. Not Used.

PART 2: PRODUCTS

2.01 REINFORCING BARS

Reinforcing bars shall conform to the requirements of the "Standard Specifications for Deformed Billet Steel Bars for Concrete Reinforcement" (ASTM A615). Reinforcing bars shall be Grade 60.

2.02 FABRIC WIRE

Welded wire fabric for concrete reinforcement shall be electrically welded wire fabric of cold drawn wire conforming to "Specification for Welded Steel Wire Fabric for Concrete Reinforcement" (ASTM A185).

PART 3: EXECUTION

3.01 SCOPE OF WORK

Reinforcement shall be accurately formed to the dimensions indicated on the drawings. Stirrups and tie bars shall be bent around a pin having a diameter not less than two times the minimum thickness of the bar, except for hooks. Bends for other bars shall be made around a pin having a diameter not less than six times the minimum thickness, except for bars larger than one inch (1"), in which case the bends shall be made around a pin of eight bar diameters. All bars shall be bent cold.

Metal reinforcement shall not be straightened or rebent in a manner that will injure the material. Bars with kinks, or bends not shown on the drawings, shall not be used. Heating of the reinforcement will not be permitted.

SECTION 03200

CONCRETE REINFORCEMENT

Metal reinforcement shall be placed in accordance with ACI 318-95, except as otherwise noted herein and accurately positioned in accordance with the information on the drawings. Protective concrete cover shall be as required in Paragraph 7.14 of 318-95. Reinforcement shall be secured against displacement by using annealed iron wire ties or suitable clips at intersections, and shall be supported by concrete or metal supports, spacers, or metal hangers.

Metal reinforcement before positioned, shall be free from loose mill and rust scale and from coatings, including ice, that destroy or reduce the bond. Where there is delay in depositing concrete, reinforcement shall be reinspected and cleaned when necessary.

All laps of wire mesh shall be one width of wire spacing and adjoining sheets shall be securely tied together with No. 14 tie wire, one tie for each two running feet. At laps, wires shall be staggered and tied in such a manner that they cannot slip.

End of Section

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1: GENERAL

A. Not Used.

PART 2: PRODUCTS

2.01 PORTLAND CEMENT

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. General:

All admixtures shall be approved by the AUTHORITY, 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 AUTHORITY for the type to be used prior to the making of the trial mixes and

further provided that they meet the requirements hereinafter specified.

B. Crystalline Waterproofing Additive:

A crystalline waterproofing additive shall be utilized on all concrete manholes. The crystalline waterproofing material shall be added to the concrete during the mixing cycle. Concrete waterproofing system shall be of the crystalline type that chemically controls and permanently fixes a non-soluble crystalline structure throughout the capillary voids of the concrete. The system shall cause the concrete to become sealed against the penetration of liquids from any direction, and shall protect the concrete from deterioration due to harsh environmental conditions. Crystalline waterproofing additive shall be equal to Xypex Admix C-500 as manufactured by Xypex Chemical Corporation.

2.03 WATER

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

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.

Fine Aggregates: Only clean natural sand shall be used. Artificial or manufactured sand will not be acceptable.

Coarse Aggregates: Coarse aggregate shall consist of crushed stone conforming to the following limits:

Sodium Sulfate	-	10% Maximum Loss
L.A. Abrasion Test	-	35% Maximum Loss
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

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

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

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 or 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.

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.

When the temperature is below 40^{o}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^{o}F minimum to 90^{o}F maximum. When the air temperature is above 90^{o}F, and adequate means of cooling the concrete mix shall be provided.

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.

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:

(a) Number of yards delivered on this truck
(b) Quantities of materials in the batch
(c) The time at which the truck left the batching plant
(d) The time at which the cement was added
(e) The outdoor temperature in the shade
(f) The numerical sequence of the delivery
(g) Date

SECTION 03300

CAST-IN-PLACE CONCRETE

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.

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.

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.

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.

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.

Concrete during and immediately after depositing shall be thoroughly compacted by means of vibration. 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.

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.

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 AUTHORITY, prior to start of work, the details of procedures he proposes to minimize and control the development of shrinkage cracks.

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.

SECTION 03300

CAST-IN-PLACE CONCRETE

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.

During those seasons of the year (after the first frost in the fall and until the daily mean temperature in the spring reaches 40^{o}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.

When the daily mean temperature drops below 40^{o}F for more than one day, the concrete shall be maintained at a temperature of 55^{o}F for Class B concrete and 50^{o}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.

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^{o}F over any 24 hour period.

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^{o}F.

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.

At air temperatures of 90^{o}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.

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 AUTHORITY grants permission to patch the defective area, in which case patching shall be done as hereinafter described.

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.

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 03345

CONCRETE FINISHING

PART 1: GENERAL

A. Not Used.

PART 2: PRODUCTS

A. Not Used.

PART 3: EXECUTION

3.01 SCOPE OF WORK

All concrete surfaces shall be finished by experienced finishers as specified as soon after placing the concrete as conditions will permit. The placing of concrete and the removal of forms shall be scheduled so that finishing the surfaces can be completed before the concrete reaches a final hard set. No cement plaster or cement brush coats will be acceptable.

Formed concrete surfaces which are to be coated or lined or exposed to view shall be finished by removing the forms as early as is practical, immediately removing the form ties to a depth of at least one inch beneath the surface, and pointing up the holes and filling all cavities and depression with a wood float or trowel. Cement mortar shall not be applied except to fill holes or cavities. Fins, form marks, projections and uneven spots shall be removed by rubbing or grinding the surfaces. The entire surface of the concrete shall then be thoroughly drenched with water and rubbed with a carborundum brick or other approved abrasive until all fins, joint marks and mortar spots have been eliminated and a smooth finish of uniform texture and appearance has been produced. Similar finishes on exterior exposed building and tank walls shall be carried one foot below finished grade. All exposed concrete surfaces (except stair treads and platforms) shall be required to present a smooth and uniform surface, and in this regard, the CONTRACTOR is advised to commence with finishing work, immediately after forms can be removed, so that same can be accomplished with a minimum of difficulty.

SECTION 03345

CONCRETE FINISHING

The tops of all exposed walls and steps, except as otherwise specified or shown on the plans, are to be finished with cement mortar consisting of one part Portland Cement and two and three-fourths parts of sand. For this work the CONTRACTOR shall use only capable experienced cement finishers by trade. The mortar is to be placed to a depth of one inch (1") on the surface of the concrete before it has set, removing the excess by means of a straight edge and then it is to be troweled to a hard, smooth finish by means of wood trowels and final surface must be perfectly smooth and leveled or graded as shown by the plans.

Unformed concrete surfaces shall be struck off to establish grade and floated with a wood float until all irregularities are removed. Where required, the surface shall then be troweled either with a wood trowel or a steel trowel, depending on the finish requirement of the area to be troweled, until a smooth dense finish is obtained. Troweling of the floated surface shall not be done until all excess water has evaporated.

Protection against loss of moisture from the surface of the concrete shall be accomplished by keeping the surface continuously wet. One of the following methods shall be used:

a). Surface remaining in contact with the form

b). The covering with burlap or cotton mats kept continuously wet and covered with polyethylene plastic

c). Continuous sprinkling of the exposed surfaces

No curing compounds shall be used on any surfaces to which pneumatic mortar is to be applied, or on which any other type of concrete mortar, paint or chemical waterproofing coating is to be used. They may be used in other places, however, upon the approval of the compound and the location by the AUTHORITY.

During hot weather curing shall be as specified in the section under "Placing Concrete in Hot Weather".

When bonding compound is noted on the drawings, it shall be "Sika dur Hi-Mod", a two component epoxy-resin system, manufactured by Sika Chemical Corporation, or approved equal.

End of Section

SECTION 03345

CONCRETE FINISHING

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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:

SECTION 03600

GROUT

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, 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

SECTION 03600

GROUT

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SECTION 11350

GRINDER PUMP UNIT

DIVISION 11 - EQUIPMENT

PART 1: GENERAL

1.01 WORK INCLUDES

CONTRACTOR shall furnish and install a factory-built and tested Grinder Pump Station consisting of grinder pump suitably mounted in a basin constructed of fiberglass or high density polyethylene (HDPE), electrical quick disconnect (NEMA 4X), pump removal system, shut-off valve, anti-siphon valve, and check valve assembled within the basin, remote electrical alarm/disconnect panel, and all necessary internal wiring and controls.

1.02 The pumps shall be capable of delivering 15 gpm against a rated total dynamic head of 0 feet (0 psig) and 9 gpm against a rated total dynamic head of 138 feet (60 psig). The pump must also be capable of operating at negative total dynamic head without overloading the motor(s). Under no conditions shall in-line piping or valving be allowed to create a false apparent head.

1.03 The equipment specified shall be a product of a company experienced in the design and manufacturer of grinder pumps for specific use in pressure sewage systems. The company shall submit detailed installation and user instructions for its product; submit evidence of an established service program including complete parts and service manuals, and be responsible for maintaining a continuing inventory of grinder pump replacement parts.

1.04 The grinder pump unit shall be finished with a part(s) and labor warranty on the complete station and accessories, including, but not limited to, panel and redundant check valve, for a period of twenty-four (24) months after notice of AUTHORITY acceptance. Repair or parts replacement required as a result of such defect will be made free of charge during this period upon return of the defective parts or equipment to the manufacturer or its nearest authorized service center.

SECTION 11350

GRINDER PUMP UNIT

PART 2: PRODUCT

2.01 Grinder pump unit shall have the following systems and shall be Model 2010 as manufactured by Environmental One or an approved equal.

A. Pump

The pump shall be a custom designed, integral, vertical rotor, motor driven, solids handling pump of the progressing cavity type with mechanical seal. The rotor shall be through-hardened, highly polished, precipitation hardened stainless steel. The stator shall be of a specifically compounded ethylene propylene synthetic elastomer. The material shall be suited for domestic wastewater service. Its physical properties shall include high tear and abrasion resistance, grease resistance, water and detergent resistance, temperature stability, good aging properties, and outstanding wear resistance.

B. Grinder

The grinder shall be placed immediately below the pumping elements and shall be direct-driven by a single, one-piece stainless steel motor shaft. The grinder impeller assembly shall be securely fastened to the pump motor shaft. The grinder will be of the rotating type with a stationary hardened and ground chrome steel shredding ring spaced in accurate close annular alignment with the driven impeller assembly, which shall carry two hardened type 400 series stainless steel cutter bars. This assembly shall be dynamically balanced and operate without objectionable noise or vibration over the entire range of recommended operating pressures. The grinder shall be constructed so as to eliminate clogging and jamming under all normal operating conditions including starting. Sufficient vortex action shall be created to scour tank free of deposits or sludge banks which would impair the operation of the pump. These requirements shall be accomplished by the following, in conjunction with the pump:

1. The grinder shall be positioned in such a way that solids are fed in an upward flow direction.

2. The inlet shroud shall have a diameter no less than 5 inches.

3. At maximum flow the average inlet velocity must not exceed 0.2 feet per second.

4. The impeller mechanism must rotate at a nominal speed of no greater than 1800 rpm.

The grinder shall be capable of reducing all components in normal domestic sewage, including a reasonable amount of "foreign objects", such as paper, wood, plastic, glass, rubber and the like, to finely-divided particles which will pass freely through the passages of the pump and the 1-1/4" diameter discharge piping.

C. Electric Motor

As a minimum, the motor shall be a 1 HP, 1725 RPM, 240 Volt 60 Hertz, 1 Phase, capacitor start, ball bearing, squirrel cage induction type with a low starting current not to exceed 30 amperes and high starting torque of 8.4 foot pounds. Inherent protection against running overloads or locked rotor conditions for the pump motor shall be provided by the use of an automatic-reset, integral thermal overload protector incorporated into the motor. This motor protector combination shall have been specifically investigated and listed by Underwriters Laboratories Inc., for the application.

D. Mechanical Seal

The core shall be provided with a mechanical shaft seal to prevent leakage between the motor and pump. The seal shall have a stationary ceramic seat and carbon rotating surface with faces precision lapped and held in position by a stainless steel spring.

E. Tank & Integral Accessway

High Density Polyethylene Construction:
The tank shall be made of high density polyethylene of a grade selected for environmental stress cracking resistance. Corrugated sections are to be made of a double wall construction with the internal wall being generally smooth to promote scouring. Corrugations of outside wall are to be of a minimum amplitude of 1 1/2" to provide necessary transverse stiffness. Any incidental sections of a single wall construction are to be a minimum .250 inch thick. All seams created during tank construction are to be thermally welded and factory tested for leak tightness. Tank wall and bottom must withstand the pressure exerted by saturated soil loading at maximum burial depth. All station components must function normally when exposed to maximum external soil and hydrostatic pressure.

The tank shall be furnished with one EPDM grommet fitting to accept a 4.50" OD DWV pipe. Tank capacities shall be as shown on the contract drawings.

The accessway shall be an integral extension of the wet well assembly and include a lockable cover assembly providing low profile mounting and water-tight capability. Accessway design and construction shall facilitate field adjustment of station height in increments of 4" or less without the use of any adhesives or sealants requiring cure time before installation can be completed.

The station shall have all necessary penetrations molded in and factory sealed. No field penetrations shall be acceptable.

All discharge piping shall be constructed of 304 Series Stainless Steel and terminate outside the accessway bulkhead with a stainless steel, 1 1/4" female NPT fitting. The discharge piping shall include a stainless steel ball valve rated for 200 psi WOG. The bulkhead penetration shall be factory installed and warranted by the manufacturer to be watertight.

The accessway shall include a single NEMA 4X electrical quick disconnect for all power and control functions, factory installed with accessway penetrations warranted by the manufacturer to be watertight. The accessway shall also include a 2"PVC vent to prevent sewage gases from accumulating in the tank.

F. Check Valve

The pump discharge shall be equipped with a factory installed, gravity operated, flapper-type integral check valve built into the stainless steel discharge piping. The check valve will provide a full-ported passageway when open, and shall introduce a friction loss of less than 6 inches of water at maximum rated flow. Working parts will be made of a 300 series stainless steel and fabric reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A non-metallic hinge shall be an integral part of the flapper assembly providing a maximum degree of freedom to assure seating even at a very low back pressure. The valve body shall be an injection molded part made of glass filled PVC.

G. Core Unit

The Grinder Pump Station shall have cartridge type easily removable core assemblies containing pump, motor, grinder, controls, check valve, anti-siphon valve, electrical quick disconnect and wiring. The watertight integrity of the core unit, shall be established by 100% factory test at a minimum of 5 psig.

H. Controls

Necessary controls shall be located in the top housing of the core unit. The top housing will be attached with stainless steel fasteners.

Non-fouling wastewater level detection for controlling pump operation shall be accomplished by monitoring the pressure changes in an integral air-bell level sensor connected to a pressure switch. The level detection

device shall have no moving parts in direct contact with the wastewater. High-level sensing will be accomplished in the manner detailed above by a separate air-bell sensor and pressure switch of the same type.

To assure reliable operation of the pressure sensitive switches, each core shall be equipped with a breather assembly, complete with a suitable means to prevent accidental entry of water into the motor compartment.

The grinder pump will be furnished with a length of 6 conductor, 12 gauge, type SJOW cable; pre-wired and watertight to meet UL requirements.

I. Alarm/Disconnect Panel

Each grinder pump station shall include a NEMA 3R, UL listed ALARM/DISCONNECT PANEL suitable for wall or pole mounting. The NEMA 3R enclosure shall be manufactured of the thermoplastic to assure corrosion resistance. The enclosure shall include a hinged, padlocked cover, secured dead front and component knockouts. The enclosure shall not exceed 7.5"W x 8.75"H x 3.75"D.

For each core, the panel shall contain one (1)-15 amp, double pole circuit and one (1) 15 amp single pole circuit breaker for the alarm circuit. The panel shall contain terminal blocks, integral power bus, push to run feature and a complete alarm circuit.

The Alarm/Disconnect Panel shall include the following features: audio & visual alarm, push-to-run switch, and high level (redundant) pump starting control. The alarm sequence is to be as follows:

1. When liquid level in the sewage wet-well rises above the alarm level, visual and audio alarms will be activated. The contacts on the alarm pressure switch will close. The redundant pump starting system will be energized.

2. The audio alarm may be silenced by means of the externally mounted, push-to-silence button.

3. Visual alarm remains illuminated until the sewage level in the wet-well drops below the "off" setting of the alarm pressure switch.

4. The visual alarm lamp shall be inside a red fluted lens at least 2 5/8" in diameter and 1 11/16" in height. Visual alarm shall be mounted to the top of the enclosure in such a manner as to maintain NEMA 3R rating. For duplex units, in addition to the above, two high level indicator lights shall be mounted behind the access cover. During a high level alarm condition the appropriate light will illuminate to indicate which pump core requires servicing.

5. The audio alarm shall be a printed circuit board in conjunction with an 86 dB buzzer with quick mounting terminal strip mounted in the interior of the enclosure. The audio alarm shall be capable of being de-activated by depressing a push-type switch which is encapsulated in a weatherproof silicone boot and mounted on the bottom of the enclosure.

6. The entire Alarm/Disconnect Panel as manufactured, shall be listed by Underwriters Laboratories, Inc.

J. Serviceability

The grinder pump core unit shall have two lifting hooks complete with nylon lift-out harness connected to its top housing to facilitate easy core removal when necessary. All mechanical and electrical connections must provide easy disconnect accessibility for core unit removal and installation. A push to run feature will be provided for field trouble shooting. All motor control components shall be mounted on a readily replaceable bracket for ease of field service.

K. Confined Space Entry Requirements

All maintenance tasks for the grinder pump station must be possible without entry of the grinder pump station (as per OHSA 1910.146 Permit required confined

spaces): "Entry means the action by which a person passes through an opening into a permit-required confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space."

L. Corrosion Protection

All materials exposed to wastewater shall have inherent corrosion protection: i.e., epoxy powder coated cast iron, fiberglass, stainless steel, PVC.

M. Safety

The Grinder Pump shall be free from electrical and fire hazards as required in a residential environment. As evidence of compliance with this requirement, the complete assembled and wired Grinder Pump Station in its tank shall be listed by Underwriters Laboratories, Inc., to be safe and appropriate for the intended use.

The grinder pump shall meet accepted standards for plumbing equipment for use in or near residences, shall be free from noise, odor, or health hazards, and shall have been tested by an independent laboratory to certify its capability to perform as specified in either individual or pressure sewer system applications. As evidence of compliance with this requirement, the grinder pump shall bear the National Sanitation Foundation seal.

N. Pressure Testing

Manufacturer will supply a pressure testing assembly for purposes of pressure testing the forced service lateral.

PART 3: EXECUTION

3.01 FACTORY TEST

Each grinder pump shall be submerged and operated for 5 minutes (minimum). Included in this procedure will be the testing of all ancillary components such as, the anti-siphon valve, check valve, discharge line, level sensors and each unit's dedicated controls. All factory tests shall incorporate each of the above listed items. Actual appurtenances and controls which will be installed in the field, shall be particular to the tested pump only. A common set of appurtenances and controls for all pumps will not be acceptable.

Certified test results shall be available upon request showing the operation of each grinder pump at two (2) different points on its curve, with the maximum pressure no less than 60 psi. The AUTHORITY reserves the right to inspect such testing procedures at the GRINDER PUMP MANUFACTURER'S facility.

All completed stations shall be factory leak tested to assure the integrity of all joints, seams and penetrations. All necessary penetrations such as inlets, discharge fittings and cable connectors shall be included in this test along with their respective sealing means (grommets, gaskets etc.).

3.02 TRAINING

The pumping units without core units shall be installed by the CONTRACTOR(s). The equipment supplier will be responsible for providing equipment start-up and/or process stabilization and balancing assistance for the equipment.

3.03 SPARE CORE

The MANUFACTURER will supply one (1) spare grinder pump core unit; complete with all operation controls level sensors, check valve, anti-siphon valve, pump/motor unit, and grinder.

3.04 MANUALS

The MANUFACTURER shall supply one (1) copy of Operation and Maintenance Manuals for each of the pump units, and one (1) copy of the same to the AUTHORITY.

End of Section