STANDARD SPECIFICATIONS
FOR
ADDITIONS AND IMPROVEMENTS
TO THE STORM AND SANITARY SEWER SYSTEMS

BETHLEHEM TOWNSHIP MUNICIPAL AUTHORITY
NORTHAMPTON COUNTY, PENNSYLVANIA

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Table of Contents

STANDARD SPECIFICATIONS
FOR DEVELOPERS

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Section 01000

GENERAL CONDITIONS

Table of Contents

SECTION 01000

GENERAL CONDITIONS

1:01 Introduction

It is the intent of the instructions, specifications, and construction standards as presented herein to comprise the minimum requirements of the Bethlehem Township Municipal Authority for the construction of storm and sanitary sewer facilities in Bethlehem Township, Northampton County, Pennsylvania.

All engineering design of storm and sanitary sewer facilities in the Township shall be accomplished by an engineering firm approved by the Authority.

All work shall be done in accordance with the requirements of the Authority and these Specifications.

The work shall be executed in the best and most workmanlike manner by qualified, conscientious, and experienced workmen.

1:02 Definitions

The following definitions shall be applicable in these Specifications:

A. Authority shall mean the Bethlehem Township Municipal Authority, its Board Members, Officers and employees.

B. Consultant shall mean any individual or company providing construction observation and/or administrative services for the Authority.

C. Contractor shall mean any individual, partnership, or corporation performing storm and/or sanitary sewer construction work for the Developer.

D. Developer shall mean any landowner, agent of such landowner, or tenant with the permission of such landowner, who makes or causes to make a subdivision of land or a land development.

E. Developer's Engineer shall mean a registered Professional Engineer or architect in the State of Pennsylvania and shall be the individual, partnership, or corporation selected by the Developer and approved by the Authority to accomplish utility design in any development in the Township.

F. Engineer shall mean the Engineer that represents the Authority. The term may also include a person authorized or employed by the Authority to observe construction on behalf of the Authority.

G. Equal shall mean equal as approved by the Authority and Engineer.

H. Subdivision shall mean the division or redivision of a lot, tract, or parcel of land by any means into two or more lots, tracts, parcels, or other divisions of land.

I. Township shall mean Bethlehem Township, its Board of Commissioners, Officers, employees and consultants.

J. Utility shall mean whenever these specifications refer to sewer lines, storm sewer, sanitary sewer, building sewer, lateral or the Authority's underground utility.

K. Work shall mean labor, services, materials, and equipment as required for the successful completion of the project.

1:03 Responsibility of the Developer

A. The Developer shall make himself familiar with the laws of the Commonwealth of Pennsylvania and the ordinances of Northampton County and Bethlehem Township concerning the employment of labor and the performance of Work. The Developer shall obtain a copy of the "Standard Specifications for Developers, Improvements and Additions to the Storm and Sanitary Sewer Systems," Bethlehem Township Municipal Authority, Northampton County, Pennsylvania, September 2023 or latest revision thereof, and shall follow and pursue the established criteria set forth therein, with no deviations, exceptions, or changes therefrom without prior written approval by the Authority and/or the Engineer.

B. The Developer will be responsible for the payment of all Excise, Sales, or Use Taxes, and all other taxes required by law on all materials, tools, apparatus, equipment, fixtures, and incidentals that he purchases or uses for the purpose of fulfilling the Work.

C. The Developer shall procure all necessary permits and licenses, including those to be obtained in the name of the Authority. He shall pay all charges and fees therefore and shall give all notices necessary and incidental to the proper and lawful prosecution of the Work.

D. Any Contractor installing storm and/or sanitary sewer lines for the Developer shall be given a copy of these Specifications and shall construct the said items in accordance with these Specifications. Use of the word "Developer" in these Specifications shall mean "Contractor", where applicable. However, the Developer shall be ultimately responsible for the satisfactory completion of his sewerage project and for the work done by his Contractor.

E. All sanitary sewer lines shall be constructed in public streets unless Authority agrees otherwise. Where Authority agrees in writing to permit sanitary sewer line construction in non-public streets, Developer shall provide Authority permanent rights-of-way, at least 20 feet wide, which rights-of-way shall be shown on Developer's plans. The same shall be clearly marked and identified as Sanitary

Sewer Line Right-of-Way to be granted to Bethlehem Township Municipal Authority. Developer shall show the course and distance around the perimeter of said rights-of-way. Developer shall provide a written perimeter description of each separate right-of-way, starting with a point of beginning oriented with a fixed point of record. In addition to the rights-of-way being depicted upon Developer's plan, he shall execute a Right-of-Way Agreement for the same unto Authority for purposes of being recorded, with rights-of-way plan and description attached, all in form satisfactory to Authority.

F. All storm sewer lines proposed for dedication to the Authority shall be constructed in public streets unless Authority agrees otherwise.

1. Where Authority agrees in writing to accept dedication of and permit storm sewer line construction in non-public streets, Developer shall provide Authority permanent rights-of-way, at least 20 feet wide, which rights-of-way shall be shown on Developer's plans. The same shall be clearly marked and identified as Storm Sewer Line Right-of-Way to be granted to Bethlehem Township Municipal Authority. Developer shall show the course and distance around the perimeter of said rights-of-way. Developer shall provide a written perimeter description of each separate right-of-way, starting with a point of beginning oriented with a fixed point of record. In addition to the rights-of-way being depicted upon Developer's plan, he shall execute a Right-of-Way Agreement for the same unto Authority for purposes of being recorded, with rights-of-way plan and description attached, all in form satisfactory to Authority.
2. Where Authority agrees in writing or agrees via permit review to permit undedicated storm sewer line construction in non-public streets, Developer shall provide Authority permanent access to the storm sewer line, any connections to said line, and any facilities that discharge to said line (including but not limited to best management practices) in accordance with the Bethlehem Township Stormwater Management Ordinance, as amended. All notes, conditions, labels, or other items that shall apply to this access as listed within the Stormwater Management Ordinance shall also include the Authority as a written party.

1:04 Submission and Review Procedure

The Developer shall cause the following actions to occur:

A. Deposit in an escrow account the amount estimated by the Authority to cover estimated engineering, construction observation, closed circuit television (CCTV) inspection, administrative, surveying, GPS data collection, modeling efforts and updates, system impact analyses, and legal costs of the Authority. This sum shall insure payment to include the following services to be performed by the Township staff, Engineer and/or Authority.

1. Review and approval of all design plans and specifications.

2. Execution of sanitary sewer permit applications as necessitated by State Law, and submission to the Commonwealth of Pennsylvania, Department of Environmental Protection.
3. Construction observation and testing of all work covered by these Specifications.
4. Closed circuit television (CCTV) inspection.
4. Authority's legal and administrative costs.
5. For the purpose of insuring as-built record submission to the Authority, the escrow shall include the total estimated cost of providing these drawings as required by paragraph 1.14. The Authority shall retain these funds until such time as the Developer provides as-built record plans acceptable to the Authority within the designated submission time frame. All remaining funds shall then be returned to the Developer within sixty (60) days of acceptance by the Authority. Failure of the Developer to provide the drawings as required shall result in the utilization of the funds toward the full costs associated with the creation of the as-built records.

The Engineer will bill the Authority on a time and expense basis for the above services. It is understood that should the actual amount of work performed by the Engineer exceed the escrow account, then this excess cost shall also be borne by the Developer. Conversely, should the actual amount be less than the escrow account, the remaining funds can be withdrawn by the Developer from the escrow account. No amount shall be withdrawn from escrow until completion of the work, and certification by the Engineer and final acceptance by the Authority takes place.

B. Submit to the Authority all land development; stormwater; erosion and sedimentation control; utility; sanitary sewer; and any other plans for the development deemed necessary by the Engineer or Authority for review and approval by the Authority and Engineer. Such plans for review and approval shall be in <u>two (2) complete copies</u>.

The Authority has adopted the following specifications for the submission of all plans:

- Horizontal scale, 1”= 50', and Vertical scale, 1” = 5'
- Utility plan size, 24" x 36" (Plans and Profiles)
- Other plan size, as accepted by regulating authority (land development, stormwater, erosion and sedimentation control, etc.)
- All utility profiles shall be placed on sheets with corresponding plan views
- All utility plans illustrating proposed lot locations shall illustrate lot numbers
- All utility plans shall illustrate north arrow
- All utility plans and profiles shall illustrate sanitary sewer locations, including all manholes as well as all proposed gas mains, water mains, storm sewers and any other underground pipelines.
- All utility profiles shall illustrate manhole rim and invert elevations

- All utility profiles shall numerically illustrate slopes, pipe sizes, manhole rim and invert elevations, distances and piping material proposed illustrated along the utility line.
- All utility plan views shall illustrate flow arrows in the direction of flow. All utility plan views shall illustrate manhole numbers.

All plans shall include the following statement:

NOTE: Storm and sanitary sewer line is to be designed and constructed in accordance with the Bethlehem Township Municipal Authority's Standard Specifications for Developers, Additions and Improvements to the Storm and Sanitary Sewer System, Bethlehem Township Municipal Authority, Northampton County, Pennsylvania, latest revision.

- All plans are to be signed and sealed by a registered Professional Engineer in the Commonwealth of Pennsylvania.
- All utility plans are to illustrate easements and rights-of-way.
- All utility and other plans are to illustrate lands to be dedicated to the Authority and/or the Township.
- All plans presented shall also include an overall utility plan illustrating the following:

Lot numbers
North arrow
Sanitary sewer utility
Manhole numbers
Flow arrows
Pipe sizes
Storm sewer and all storm sewer structures
Water mains
Gas mains

The overall utility plan will not be subject to the previously stated horizontal scale. The overall utility plan must remain independent of the soil erosion and control plan.

Any revised plans shall also be two (2) complete sets and shall be accompanied by a letter addressing all comments from the previous review and what revisions were made in response to those comments.

Subsequent to final approval by the Authority and Engineer, provide three complete sets of plans. One (1) set shall be used in the field (FIELD COPY), one (1) set shall be used for recording construction information, (OFFICE COPY), and one (1) set shall be stored as a Clean Set (CLEAN SET) for future use.

C. The Developer shall provide and furnish to the Authority (before the start of any storm and/or sanitary sewer construction work) proof of security established with

the Bethlehem Township Board of Commissioners as per Township guidelines. This shall serve as guarantee that the Work will be done in accordance with the approved plans and specifications. For storm sewer and sanitary sewer, the Security shall be in accordance with the regulations of the Municipalities Planning Code, as amended, and as determined by the Township Engineer.

When a sanitary sewer project or specified part is constructed, the Developer may in writing request a reduction in his established security. The Authority shall review the request for compliance with these specifications and release funds appropriately. The Authority recognizes the following table as the method used to grant reductions of security upon completions of a sanitary sewer project or specified part.

(SANITARY SEWER CREDIT REDUCTION TABLE)

* SANITARY SEWER PIPE – Construction Observer Verified and Low-Pressure Air Tested	90%
SANITARY SEWER PIPE – Mandrel Test and Television Inspection Complete	100%

MANHOLES – Construction Observer Verified	90%
x MANHOLES – Vacuum Tested	100%

* LATERALS – Construction Observer Verified and Low-Pressure Air Tested	90%
LATERALS – In Conjunction with Mains that are Televised	100%

* (Connections to the system are prohibited.)

x (At the Authority's discretion, all manholes tested prior to final wearing course paving must be re-tested prior to final acceptance.)

When a storm sewer project or specified part is constructed, the Developer shall follow Township procedure for requesting reduction of the Security.

It shall be the responsibility of the Developer to accomplish and bear all costs for the connections of the Work to the existing storm and/or sanitary sewer system. The Developer shall cooperate with the Authority in placing sanitary sewer service laterals to existing properties or homes when the sanitary sewer system is extended beyond those properties to the Subdivision.

1:05 Insurance by the Developer

A. Workmen's Compensation Insurance

The Developer shall take out and maintain in amounts required by law, Workmen's Compensation Insurance for all his employees employed at the site of the project, and in case any Work is sublet, the Developer shall require the subcontractor similarly to provide Workmen's Compensation Insurance for all the latter's employees. The Developer shall, at all times, indemnify and save harmless

the Authority, Township and Engineers, their officers and employees and their Consultants, of and from all claims for Workmen's Compensation which may be made by any of the employees of the Contractor or by any of the employees of any subcontractor.

B. Public Liability and Property Damage Insurance

The Developer shall, at all times, indemnify and save harmless the Authority, Township, Engineers and Consultants of and from all claims for Public Liability and Property Damage. The Developer shall enter into an agreement with the Authority and said agreement shall be endorsed by the Developer or an authorized representative of the Developer and authorized representatives of the Bethlehem Township Municipal Authority. This agreement shall be witnessed and notarized to include the aforementioned endorsements.

The Developer shall take out and maintain such Public Liability and Property Damage Insurance as shall protect him, the Authority, Township, Engineers, their officers and employees, and their Consultants from claims for damages for personal injury, including accidental death, as well as from claims for property damages, which may arise from operations by the Developer whether such operations are by himself or by any subcontractor or by anyone directly or indirectly employed by either of them. Hazards insured against for property damage liability shall include explosion, collapse, underground object, and blasting, to the extent that any such exposure exists.

The Developer, their heirs, executors, administrators and assigns, shall be solely responsible for any and all damage, injury or loss caused from drainage, sedimentation, or erosion damage incurred by downstream properties as a consequence of developing their Subdivision and shall, at their own expense, repair any damage done to abutting property owners or their land because of said drainage, sedimentation or erosion damage. Anything to the contrary notwithstanding, the Developer hereby agrees to exonerate, indemnify and save Authority, Township, Engineers, their officers and employees, and their Consultants harmless from and against any and all claims, actions of any nature or kind, and to pay all expenses incidental to the defense of any such claims or actions which such claims or actions may in any manner arise out of the drainage, sedimentation or erosion damage arising as a consequence of developing their Subdivision.

C. Minimum Amounts of Insurance

The Developer shall carry or cause to be carried the following forms of insurance applying to all operations undertaken by him, his agent, employees, and subcontractors in the minimum amounts indicated hereunder.

	Form	Minimum Limits
1.	Workmen's Compensation	Proof of coverage
2.	Workmen's Compensation	Statutory
3.	Contractor's Public Liability *(including specific contractual liability)*	$1,000,000 each occurrence $ 2,000,000 aggregate
4.	Contractor's Property Damage Liability including explosion, collapse hazard, underground damage hazard, and blasting *(XCU Coverage)*	$1,000,000 each accident $2,000,000 aggregate
5.	Automobile Bodily Injury	$1,000,000 each occurrence $ 2,000,000 aggregate
	Automobile Property Damage	$1,000,000 aggregate
6.	If subcontractors are employed, Contractor's Protective *(Contingent)* Liability Protection	
	Bodily Injury	$1,000,000 each occurrence $ 2,000,000 aggregate
	Property Damage	$1,000,000 each occurrence $ 2,000,000 aggregate
7.	Umbrella/Excess Liability (providing additional coverage over above liability coverage)	$ 3,000,000 each occurrence $ 3,000,000 aggregate
8.	Contractors Limited Pollution Liability, Bodily Injury, Property Damage and Clean-Up Cost	$500,000 each occurrence

The Developer shall file with the Authority properly executed Certificates of Insurance or copies of the insurance policies, naming Bethlehem Township, including the Board of Commissioners, their Officers and employees, Bethlehem

Township Municipal Authority, including their Board members, Officers and employees, Engineers, and other Consultants of the Authority additionally insured prior to the time construction has begun. All such insurance shall be in sound insurance companies, satisfactory to the Authority, and authorized to do business in the Commonwealth of Pennsylvania.

1:06 Conduct of Work and Safety

The Developer shall make use of all reasonable means to maintain the normal flow of traffic on Township and State Highways during all phases of construction. Should it become necessary to close any street or highway, the Developer shall obtain permission to do so from the applicable governing agency. The Developer must submit a traffic control plan for review by Bethlehem Township a minimum of three working days prior to commencing work within Bethlehem Township rights-of-way. The Developer shall erect suitable warning lights and signs at each end of the street closures, sufficient distance from the work to alert motorists of construction. The Developer shall also erect applicable signs indicating the route of detours. All traffic control shall be in accordance with PA DOT Publication 213. Work on State Highways shall be in accordance with PA DOT requirements.

Caution shall be exercised at all times for the protection of persons and property. The safety provisions of applicable laws and building and construction codes shall be observed.

The Developer and his Contractor shall take all precautions and furnish and maintain all guards, barricades, handrails, lights, and other appurtenances, etc., for the prevention of accidents to all persons or property at or near the project.

The Developer shall be responsible for and shall see that all equipment, tools, and supplies are operated or handled in such a manner that at no time will they be permitted to contact power, telephone, or other lines.

The Developer alone shall be responsible for the safety, efficiency, and adequacy of his plant, appliances, and methods, and for any damage which may result from their failure or their improper construction, maintenance, or operation.

The Developer shall take care to repair all works in the Township affected by construction. These works shall have an appearance or state equal to or better than that which existed prior to the construction.

1:07 Equipment and Materials

Whenever any item of equipment or material is designated by reference to a particular brand, manufacturer, or trade name in these Specifications or Plans, it is understood that an approved equal product may be substituted, if acceptable by the Authority and Engineer, unless specifically identified as "No substitutions".

Each major item of equipment shall be inspected by a manufacturer's representative during installation and upon completion of the work. The Developer shall supply the Authority with a certificate of such inspection.

The use of any equipment and materials other than as specified or beyond the scope of these Specifications (for example, metering stations, sewage pumping stations, innovative best management practice installation and connection, etc.) must be approved, in writing, by the Engineer. The Developer shall ascertain the Authority's requirements for such special items prior to submitting plans for approval.

1:08 Location and Protection of Existing Utilities

In preparation for and prior to commencing with the excavation work required by this Project, the Developer or Contractor shall comply with requirements of Pennsylvania Underground Utility Line Protection Act, Act 287 of 1974, as amended by Act 121 of 2008, (the "Act"). The Developer will be responsible for locating all existing utilities including, but not limited to water, steam, oil, gas mains, sanitary and storm sewers, cable, telephone and electric conduits that may be encountered during the construction operation. He shall also be responsible for locating all underground structures. He shall, at his own expense, arrange with the owners of such utilities for locating them. The Developer shall be held responsible for providing adequate protection against damage to utilities encountered during construction and shall be responsible for repair of any utilities damaged during his construction. Refer also to Section 02015 of these Specifications.

1:09 Emergency Maintenance During Construction

The Developer shall always have available, including nights and holidays, an emergency maintenance crew and a person of authority and responsibility to act in cases of emergency, such as flooding, cave-ins, or other disorders, resulting from the construction in this Subdivision. Such person(s) shall be made known to the Authority prior to the start of any storm and/or sanitary sewer construction. The Developer will be responsible for the cost of any such emergency work.

In the event the Developer fails to perform such emergency maintenance within a reasonable period of time, the Authority may have the work performed at the Developer's expense.

1:10 Construction Observation

The Developer shall afford every facility for inspection of materials and workmanship and shall prosecute the work in a systematic manner. The absence of Authority's designated construction observer will not in any way lessen the obligation of the Contractor for construction in accordance with the Specifications.

The Developer or its agent shall contact the Authority a minimum of forty-eight (48) hours prior to starting storm and/or sanitary sewer related work. Authority and/or their

authorized representative will observe 100% of the construction and testing of all facilities to be dedicated to the Authority and any other additional work that will affect the storm and/or sanitary sewer system. Once work has begun and continues to progress, the Developer shall provide notice to the Authority prior to the end of construction that day for cancellation of construction observation services if no work is to be performed the following day or days. Failure to provide such notice of cancellation will result in charges to the Developer. If the Developer intends to work prior to or beyond normal Authority business hours, the Authority and/or their construction observer must be given a minimum of twenty-four (24) hours notice.

All travel time to and from the work site, record keeping, and other project related documentation will be charged to the Developer as construction observation work. The Developer will be charged 1.5 times the typical hourly rate for any construction observation work over eight (8) hours per day and for all weekend and holiday work – including travel time to and from the work site.

The Authority's representative is to make final inspection within ten (10) working days after Authority receives written notification by the Developer that the work is completed and final inspection is requested. Defective work or work not conforming to the Specifications is to be repaired or replaced to the satisfaction of Authority's representative.

1:11 Possession After Testing

A. After any section of storm and/or sanitary sewer has been tested, televised, and has received a written certification of substantial completion from the Authority, as stipulated in the following sections herein, the Authority may use the completed section. Issuance of a written certification however, will not imply final acceptance. The Developer shall be responsible for the maintenance of all completed portions of the line, whether used by the Authority or not, until the final inspection is made and for a period of eighteen (18) months after acceptance by the Authority in conjunction with all Township approvals.

B. The date of substantial completion of a storm and/or sanitary sewer project or specified part of a project is when the construction is sufficiently completed, in accordance with these specifications, so that the Authority can occupy or utilize the storm and/or sanitary sewer or specified parts for its intended purpose.

1:12 Maintenance and Completion

The Developer shall, after final inspection but prior to acceptance by the Authority maintain and repair the line and trench, including paving for a period of eighteen (18) months, following date of acceptance certificate, and rebuild or replace the same in whole or in part if defective. Upon written notice from the Engineer, Authority or Township, the Developer shall immediately make any repairs that may be necessary, or, in case the same are not effected promptly, such repairs will be made by Authority or Township, at expense of Developer or his Surety. In case of an emergency where delay would cause

serious loss or damage, Authority or Township may undertake to effect any repair, replacement, or rebuilding without previous notice, and the expense of the same shall be borne by the Developer or his Surety.

1:13 Final Acceptance of Work

Following issuance of written acceptance of certification by the Authority of said lines, the Authority shall then become the owner of said extension line or lines, subject to the duty of Developer to maintain, repair, rebuild, or replace as referred to above under Paragraph 1:12.

1:14 As-built Record Drawings

During the review process (of the final submission product) one set of hardcopy plans are required for review purposes only. All final records, once approved by the Authority, must be delivered in Adobe PDF.

For sanitary sewer lines, as-built records and drawings shall be submitted to the Authority **within sixty (60) days from the completion of base course paving of all applicable roadways.** For storm sewer lines, as-built records and drawings shall be submitted to the Authority **within sixty (60) days from the completion of final vegetative establishment for the development. All** drawings for review prior to acceptance by the Authority shall consist of approved prints, legibly marked. These drawings are to become the property of the Authority. Plans must be consistent in format with Paragraph 1:04 B. The following field verified data must be on the plans, signed and sealed by a registered surveyor or engineer:

Plan View
Structure location (including but not limited to manholes, inlet boxes, outlet structures, endwalls/headwalls, etc.), including dimension from curb line where applicable
Locations of all laterals stationed from downstream manhole
Lateral lengths from main to end, including calculated depths
Lateral depths shall be provided from top of curb elevation to invert elevation at end of pipe
All sewer segment pipe lengths
Final grading and center location (via latitude/longitude coordinates) of all best management practices

Profile View
Rim/grate/top-of-wall elevation of all structures
Invert elevations of all structures
Length of all sewer segments
Slope of all sewer segments

Special Construction

Special construction shall include, but not be limited to, pump stations, meter stations, inverted siphons, concrete encasements, cradles, anchors, bypass connections, valve pits, and innovative best management practices. As-built drawings for all special constructed facilities shall include complete plans, profiles, sectional views, diagrams, and electrical schematics. All information must be field verified of actual construction.

Operation and Maintenance Manuals

The Developer shall provide two copies of manufacturers operation and maintenance manuals for all applicable mechanical and electrical equipment. If operations and maintenance specifications are written by the Developer's Engineer (for example, for stormwater best management practices), the Developer shall provide these specifications in a form and number acceptable to the Authority and Engineer.

As-built Record Fees

The Developer shall be responsible for bearing all costs associated with filing as-built record data, data conversion, and data storage into the Authority's electronic record system. **For the purpose of insuring submission, the Developer will be required to deposit into the established escrow account the necessary funds.**

All submitted data is subject to review and approval prior to acceptance within the fee classification. The Authority reserves the right to reject any electronically submitted data it feels does not meet **their** minimum data conversion standards. The Developer must comply with the reproducible requirements above.

The Developer shall be responsible for bearing all costs associated with the security necessary to ensure the final submission of all as-built record plans, including but not limited to: reviews, approvals, and final electronic record submission. All submissions are subject to the associated costs incurred by the Authority in performing the as-built review process. The Authority reserves the right to reject any submission that does not meet the minimum standards**. Prior to the start of construction, the Developer will be required to post security in the form of a cash escrow at a base charge of $1,600.00 per phase submission and a sanitary sewer segment charge of $1.50 per linear feet of sewer.**

1:15 Applicability of Specifications

Specifications may apply only to storm sewer, only to sanitary sewer, or to both systems. In all cases, applicability will be noted within the section title of the specifications regarding which system(s) the specification applies to.

1:16 Conflict Between Regulations

If any conflict is noted, observed, suspected, discovered, or otherwise made aware to the Developer between these specifications and any other regulating document, he shall immediately contact the Authority and Engineer for clarification and/or resolution of the apparent conflict. In such cases, the Authority and Engineer may prescribe alternative specifications or relief at their sole discretion.

END OF SECTION

SECTION 01570

TRAFFIC REGULATION
FOR STORM AND SANITARY SEWER SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. General requirements for control of public traffic through the Work area with the goal of ensuring safe and efficient traffic movement and providing safe working conditions for Contractor's personnel.

1.02 REGULATORY REQUIREMENTS

A. Requirements of Regulatory Agencies:
   1. Traffic regulation on streets other than State Highways shall be performed in accordance with the requirements of the Township of Bethlehem. Work within Township street rights-of-way is prohibited prior to the Contractor submitting a traffic control plan for review and approval by the Township a minimum of three (3) working days before commencing work. The approved traffic control plan must be at the job site while the work is being performed.
   2. The Contractor shall provide traffic control in complete compliance with the rules and regulations of the Pennsylvania Department of Transportation (PA DOT), including but not necessarily limited to the following:
      a. PA Code Title 67, Transportation: Chapter 212 (Publication 213).
      b. PA Code Title 67, Transportation: Chapter 459 - Occupancy of Highways by Utilities.
      c. Section 901 "Maintenance and Protection of Traffic During Construction" of the Commonwealth of Pennsylvania Department of Transportation Specifications Publication 408, latest edition, and such other sections therein which complement Section 901.
   3. Traffic control requirements within Township street right-of-way may be indicated on the approved subdivision Drawings by way of diagrams taken from Publication 213 of the PA DOT regulations.
   4. The traffic control diagrams shall be used to establish the minimum requirements for the Project and in no way preclude the installation of additional control

B. State Highways:
   1. The Contractor shall provide traffic control in complete compliance with the rules and regulations of the Pennsylvania Department of Transportation (PA DOT), including but not necessarily limited to the following:
      a. PA Code Title 67, Transportation: Chapter 212 (Publication 213).

b. PA Code Title 67, Transportation: Chapter 459 - Occupancy of Highways by Utilities.
c. Section 901 "Maintenance and Protection of Traffic During Construction" of the Commonwealth of Pennsylvania Department of Transportation Specifications Publication 408, latest edition, and such other sections therein which complement Section 901.

2. Traffic control requirements within State Highway right-of-way may be indicated on the approved subdivision Drawings by way of diagrams taken from Publication 213 of the PA DOT regulations.
3. The traffic control diagrams shall be used to establish the minimum requirements for the Project and in no way preclude the installation of additional control measures.

C. All signing, barricades, cones, and other traffic control devices shall conform to the requirements of PA Code Title 67, Transportation: Chapter 212 (Publication 213).

PART 2 - PRODUCTS

NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION

NOT APPLICABLE TO THIS SECTION

END OF SECTION

SECTION 02015

PROTECTION OF UNDERGROUND UTILITIES FOR STORM AND SANITARY SEWER SYSTEMS

PART 1 - GENERAL

1.01 PROJECT CONDITIONS:

A. In preparation for and prior to commencing with the excavation work required by this Project, Contractor shall comply with the requirements of Pennsylvania Underground Utility Line Protection Act, Act 287 of 1974, as amended by Act 50 of 2017, Underground Utility Protection Law AKA PA One Call Law (the Law) and this specification Section.

B. The existence and location of underground utilities shown on the Drawings is based on information supplied by the underground utility owners to the Developer's Engineer in accordance with the Law. Neither the Authority nor the Engineer warrants the accuracy of this information; this information is intended to serve as notification that such utilities exist in the general proximity of the Work.
   1. Contractor shall be responsible for the protection against direct or indirect injury of known existing underground pipes, conduits, utilities, and structures, or other property in the vicinity of the Work, or those that may be discovered during performance of the Work.
   2. Contractor shall maintain on site, during performance of the Work, a sufficient quantity of suitable materials, for sustaining or supporting any structure or utility that may be uncovered, which may be weakened, or otherwise compromised, whether or not such structure or utility is indicated on the Drawings.

C. The Contractor shall comply with notification provisions of the Law. Excavation shall only begin after notification by the Contractor of its intent to dig, is given to the One-Call System, within the time required by the Law. Damage to existing utilities resulting from the failure of the Contractor to follow the notification requirements of the Law shall be at Contractor's expense and no additional compensation will be provided.
   1. Contractor shall notify the utility not less than three nor more than ten business days prior to beginning excavation or demolition work.
   2. In case of complex projects notification shall be given not less than ten business days prior to beginning excavation or demolition work.
   3 If the Contractor removes its equipment and vacates the work site for more than two business days, (s)he shall notify the One Call System again, unless other arrangements have been made directly with the utility owner(s) involved.
   4. If the location of excavation changes, a new notification shall be made.
   5. Contractor shall provide the One-Call System with specific information to identify the site of the proposed work. Contractor shall provide any other information requested by the One-Call System.
   6. Contractor shall obtain a serial number from the One Call System evidencing compliance with notification requirements of the Law.

7. Contractor shall schedule and conduct a preconstruction meeting with the utility owners. Written notice of this meeting shall be provided to the Engineer a minimum of seven (7) business days in advance of the meeting. When a utility owner, with facilities located within the project area, requests a meeting with the Contractor, the Contractor shall promptly arrange and attend such a meeting. Contractor shall provide full accounting of any such meetings to the Engineer.
8. If the utility owner fails to respond to the Contractor's request to the One Call System, or the facility owner notifies Contractor that the utility cannot be marked within the time frame, and a mutually agreeable date for marking cannot be arrived at, the Contractor may proceed with excavation as scheduled, but not earlier than the lawful dig date.
9. If the Contractor has reason to believe that the facilities have been overlooked or marked incorrectly, the Contractor shall contact the One Call System and re-notify the utility owner. If, after re-notification, sufficient information to safely excavate is still not provided, Contractor shall be compensated, by the Developer, in accordance with the payment provisions of the Law and of the Contract, for all costs resulting from repairs to, or replacement of damaged, existing underground utilities or structures.

D. Contractor shall establish procedures, for emergency action and repairs to utilities accidentally damaged during construction, with the utility owners prior to the commencement of work. During the work, if the Contractor accidentally damages an existing utility, the Contractor shall immediately follow the established procedures for emergency action and repairs. accidentally damaged during construction, with the utility owners prior to the commencement of work. During the work, if the Contractor accidentally damages an existing utility, the Contractor shall immediately follow the established procedures for emergency action and repairs.
1. Contractor shall immediately notify 911 and the utility owner if the damage results in the escape of any flammable, toxic, hazardous or corrosive gas or liquid, which endangers life, health, or property.
2. Contractor will not be subject to liability, or incur any obligation to utility owner, or others who sustain injury to person or property if Contractor has complied with the terms of the Law and has not otherwise been negligent.
3. When the Contractor damages a utility during the excavation work and the damage results in personal injury or property damage to parties other than the Contractor or the utility owner, the Contractor shall submit an incident report to the Pennsylvania Public Utility Commission and to any other agency required by the Law, no later than ten (10) business days after the incident. A copy of the incident report shall also be submitted to the Engineer and Owner.

E. **Provided that existing services had been correctly marked prior to excavation operations and further provided that the Contractor did not further damage the existing service line(s)**, when the Contractor, during the progress of the excavation, uncovers utility services, which because of previous (concealed) damage or age are in poor condition, the Contractor shall immediately notify the utility owner in order that steps may be taken for replacement or repair.

1. Locations of repairs, and the procedures of repairs that have been made by Contractor, at the direction of the utility owner, shall be recorded by the Contractor.
2. Contractor shall be compensated, by the Developer, in accordance with the payment provisions of the Law and of the Conditions of the Contract, for all costs resulting from repairs, or replacement authorized by the utility owner.
3. In the event the Contractor, during the progress of the excavation, further damages the existing service line(s) (s)he shall be responsible for the resulting costs.

F. Pipes, conduits, and other underground utilities exposed as a result of the Contractor's operations, shall be adequately supported, along their entire exposed length, by timber or planking, installed in such a manner that the anchorage of the supporting members will not be disturbed or weakened during the backfilling operations. Backfill of selected material shall be carefully placed and compacted under and around the supports, and all supports shall be left in place as a guard against breakage of the supported facility due to trench settlement.

G. Contractor shall perform exploratory excavations when, in the opinion of the Engineer, the utility owner, or the Developer, it is necessary to determine, or confirm the location(s) of existing underground structures and utilities.
1. Contractor shall excavate test pits to determine the location and elevation of existing subsurface utilities, or structure(s) at locations where indicated on the Drawings and other areas as directed by the Engineer. Excavate such test pits in the presence of an authorized representative of the utility/structure owner. Contractor may not proceed with excavation work without the prior notification and approval of the owner of the subsurface utility, or structure(s).
2. Contractor may not proceed with excavation work in locations where new utility lines are to be connected to existing utility lines until test pits have been dug and the exact location and elevation of the existing utility has been determined.
3. Work required for digging test pits at the request of the Engineer, utility owners or other interested parties will be classified as "Miscellaneous Unclassified Excavation".
4. Test pits or other miscellaneous excavation performed for the Contractor's convenience will be at Contractor's expense.

H. Contractor shall plan the excavation to avoid damage to or minimize interference with underground utilities in the construction area. Excavation that requires temporary or permanent interruption of a utility service shall be coordinated with the affected utility owner.

PART 2 - PRODUCTS

NOT APPLICABLE TO THIS SECTION

PART 3 - EXECUTION

NOT APPLICABLE TO THIS SECTION

END OF SECTION

SECTION 02151

SHORING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Shoring, sheeting and bracing necessary to protect excavations against loss of ground, caving or slipping.

B. Shoring, sheeting and bracing necessary to protect existing buildings, streets, walkways, utilities, and other improvements.

1.02 RELATED SECTIONS

A. Trenching, Backfilling, and Compacting: Section 02221.

1.03 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:
   1. Shoring materials and installation work shall conform to Federal, State and local laws, rules, regulations and requirements.
   2. Provide material for sheet piling, sheeting bracing and shoring and drive or set in place in accordance with Federal, State and local laws for excavations and construction and as may be required to protect the workers and the public.

1.04 SITE CONDITIONS

A. Responsibility for Condition of Excavation:
   1. The failure or refusal of the Authority, or their agents or employees, to suggest the use of bracing or sheeting, or type of materials, or to suggest sheeting, bracing, struts, or shoring to be left in place, shall not in any way or to any extent relieve the Contractor of any responsibility concerning the condition of excavation or of any of the obligations under the Contract, nor impose any liability on the Authority; nor shall any delay, whether caused by any action or want of action on the part of the Contractor, or by any act of the Authority, or their agents, or employees, resulting in the keeping of any excavation open longer than would otherwise have been necessary, relieve the Contractor from the necessity of properly and adequately protecting the excavation from caving or slipping, nor from any of the obligations under the Contract relating to injury to persons or property, nor entitle Contractor to any claims for extra compensation.

B. Tight Sheeting:
   1. Protect excavations deeper than eight feet with tight sheeting from the top of the original grade to below the structure foundation or to the bottom of utility trench except for excavations where stable rock is encountered. If stable rock is encountered at a depth greater than eight feet but above the structure foundation, or the bottom of utility trench, carry sheet down to the top of the rock.
   2. Contractor, at her/his discretion and expense, may use other, OSHA approved, methods for protection of excavations in lieu of tight sheeting.

C. The Authority or Engineer reserves the right to order sheeting and bracing left in place for the protection of the finished work or adjacent property. Sheeting and bracing which have been ordered left in place by the Authority or Engineer must be removed for a distance of three feet below the established or existing grade, whichever is lower. Trench bracing, except that which must be left in place, may be removed when the backfilling has reached the respective levels of such bracing.

D. Before starting work, check and verify governing dimensions and elevations.

E. Protect existing active sewer, water, gas, electricity and other utility services and structures.

F. Notify municipal agencies and service utility companies having jurisdiction. Comply with requirements of governing authorities and agencies for protection, relocation, removal and discontinuing of services, as affected by this work.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Provide suitable shoring and bracing materials which will support loads imposed.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Drive or set sheeting, sheet piling, braces or shores in place and arrange such that they may be withdrawn as the excavations are backfilled, without damage to piping and structures, and without damage to or settlement of adjacent structures and pavements.

B. Authority reserves the right to order sheeting driven to the full depth of the excavation or to such additional depths as may be required for the protection of the work.

C. Maintain shoring and bracing in excavations regardless of time excavations will be open. Carry down shoring and bracing as excavation progresses.

D. When tight sheeting is required, it shall be driven to prevent adjacent soil from entering the excavation either below or through such sheeting.

E. Install internal bracing, if required, to prevent spreading or distortion to braced frames.

F. Remove sheeting, shoring and bracing in stages to avoid disturbance to underlying soils and damage to structures, pavements, facilities, and utilities.

G. Repair or replace, as acceptable to Authority or Engineer, adjacent work damaged or displaced through installation or removal of shoring and bracing work.

END OF SECTION

SECTION 02221

TRENCHING, BACKFILLING, AND COMPACTING FOR SANITARY SEWER SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Trench Excavation for Piped Utilities.

B. Bedding and Backfilling.

C. Surface Restoration.

1.02 RELATED SECTIONS

A. Soil Erosion and Sedimentation Control: As shown on approved Subdivision Plans.

B. Protection of Underground Utilities: Section 02015.

B. Shoring: Section 02151.

C. Gravity Wastewater Sewer: Section 02731.

D. Force Mains: Section 02732.

E. Division 3 - Concrete.

1.03 DESCRIPTION

A. Definitions:

1. Unclassified Excavation: Removal of materials of any kind in the excavation, including rock excavation.
2. Rock Excavation: Removal of consolidated hard mineral material mass exceeding one-half cubic yard in volume which, cannot be excavated except by drilling and blasting or drilling and wedging. Structure foundations of concrete or of masonry or stone laid in cement-mortar is classified as rock if the volume requiring removal at any single location exceeds one-half cubic yard. No soft or disintegrated rock which can be removed with a pick, or any material which can be broken down by sledgehammers, or any ledge or single boulder less than one-half cubic yard in volume, or loose, shaken, or previously blasted rock, or broken stone in rock filling

or elsewhere, or rock exterior to the line of measurement as hereinafter specified, will be allowed as rock.

a. Items involved in the excavation such as sidewalks, curbs and street or roadway paving of whatever material is not classified as rock excavation.

3. Earth Excavation: Removal of materials of any kind in the excavation which cannot be classified as rock excavation.
4. Miscellaneous Unclassified Excavation: Unclassified excavation required by the Engineer and not included in other items.
5. Subgrade: Trench bottom prepared as specified to receive pipe bedding, concrete cradle or concrete encasement or the bottom of excavations prepared to receive pipeline structures.

1.04 REFERENCES

A. American Association of State Highway and Transportation Officials (AASHTO):
   1. AASHTO T99, Moisture-Density Relations of Soils, Using a 5.5-lb. Rammer and a 12-in. Drop.
   2. AASHTO T191, Standard Method of Test for Density of Soil In-Place by the sand cone method.

B. The "PDT Sections" noted herein refer to sections contained in the Commonwealth of Pennsylvania Department of Transportation Specifications Publication 408, latest edition. The references pertain only to materials, construction equipment, methods and labor. The payment provisions do not apply to work to be performed under this Contract.

C. Commonwealth of Pennsylvania Department of Transportation Specifications.
   1. PDT Section 703 Aggregates

D. State Code: Commonwealth of Pennsylvania, Pennsylvania Code, Title 67, Chapter 459, Occupancy of Highways by Utilities.

E. State Publication: Commonwealth of Pennsylvania, Pennsylvania Code, Title 67, Chapter 213.

1.05 PROJECT CONDITIONS

A. State Highways: All work within the right-of-way of State Highways shall be performed in strict accordance with the requirements of PA DOT Chapter 459.

PART 2 - PRODUCTS

2.01 MATERIAL

A. Backfill Material (To Restoration Depth in Seeded Areas): On-site, or imported (borrowed), excavated material, free of cinders, ash, refuse, vegetable or organic material, boulders, rocks, stone, or other material which, in the opinion of the Engineer, is unsuitable. Backfill material may not contain stones larger than six (6) inches in maximum dimension. A maximum of 20% of the backfill volume may be stones so long as the stones are evenly distributed within the material.

B. Aggregate Backfill and Bedding: Fine aggregates and coarse aggregates conforming to PDT Sections 703.1 and 703.2. Aggregate Backfill and Bedding requirements established under "Classification of Backfill and Bedding Materials," specified below.

C. Classification of Backfill and Bedding Materials:
   1. Pipe Bedding: AASHTO No. 8 or AASHTO No. 57 Coarse Aggregate.
   2. Initial Backfill: AASHTO No. 8 or AASHTO No. 57 Coarse Aggregate.
   3. Aggregate Backfill (To Restoration Depth): PA DOT No. 2A Coarse Aggregate within all existing paved areas, where directed by the Authority, or otherwise required by the Township.

D. Flowable Fill: Type A as specified in PA DOT Publication 408, Section 220.

E. Topsoil: On-site or imported screened, fertile, friable, natural, productive surface topsoil; free of subsoil, clay, stones, or similar hard objects larger than 2 inches in greatest dimension, and partially disintegrated debris and materials toxic or harmful to growth.

F. Lawn seed mixture shall be equivalent to the following:

Red Fescue	40%
Common Kentucky Bluegrass	40%
Annual Ryegrass	20%

G. Pasture and Meadow Grass seed mixture shall be equivalent to the following:

Timothy	18%
Orchard Grass (Pennlate or Pennmeade)	46%
Redtop	18%
Kentucky Bluegrass	18%

H. Underground Warning Tape:
   1. Printed, and alkali resistant, polyethylene tape, 3 inches minimum width, color coded, 1-inch minimum lettering, printed with name or symbol of utility buried below, and suitable for installation in all soil types. Magnetic type shall be manufactured with foil back or other means to enable detection, by a metal detector, when it is buried up to 4 feet deep.
   2. Magnetic.
   3. Provide for:
      a. HDPE sewage force main, green.
      b. PVC gravity sewer, green

PART 3 - EXECUTION

3.01 TRENCH PREPARATION AND EXCAVATION

A. Perform sheeting and shoring in accordance with requirements of Shoring: Section 02151.

B. Perform soil erosion control work in accordance with requirements of the approved subdivision Soil Erosion and Sedimentation Control plan.

C. General: Excavation of every description and of whatever substances encountered shall be performed to the lines and grades indicated on the Drawings and specified herein, or as directed by the Engineer.
   1. Excavation shall be made by open cut, unless written permission to tunnel or bore is given by the Engineer or is specifically outlined in the specifications or shown on the Drawings.
   2. Trenches may be excavated and backfilled either by machinery or by hand as the Contractor may elect, provided, however, the Contractor shall use hand excavation where necessary to protect existing structures, utilities, or private or public properties specified.

D. Stripping, Storing and Restoring Surface Items: The Contractor shall remove all paving, sub-paving, curbing, gutters, brick, paving block, granite curbing, flagging or other similar materials, and grub and clear the surface over the area to be excavated. Properly store and preserve such materials that may be required for future use in restoring the surface. The Contractor shall be responsible for any loss or damage to said materials because of careless removal or neglectful or wasteful storage, disposal, or use of the materials.
   1. All materials which may be removed, including rock, earth and sand taken from the excavation, shall be stored, if practical, in the roadway or such other suitable place and in such manner as the Authority shall approve.
   2. If more materials are removed from any trench than can be backfilled over the completed pipe or stored in the street, leaving space for traffic, the excess materials shall be removed and stored at a suitable site provided by the Contractor.

3. The Contractor shall, at his own expense, bring back as much of the approved materials so removed as may be required to properly refill the trench.
4. When directed by the Authority or Engineer, the Contractor shall furnish such other suitable materials as may be necessary to properly refill the trench.
5. The Contractor shall restore all shrubbery, fences, poles or other property and surface structures, removed or disturbed as a part of the work, to a condition equal to that before the work began, furnishing all labor and materials incidental thereto.
6. The Developer or Authority may mark certain trees, shrubs, or other items that are not to be disturbed or damaged. In the event such items are disturbed or damaged, they shall be replaced or compensated for at the Contractor's expense.
7. Any tree which is approved by the Developer or Authority for removal on private property shall be cut into four-foot lengths and stacked next to the pipeline right-of-way and become the property of the land owner, unless said landowner requests that it be removed and disposed of.

E. Width of Trench: Pipe trenches shall be sufficiently true in alignment to permit the pipe to be laid in the approximate center of the trench. The trench shall be wide enough to provide a free working space on each side of the pipe; however, the trench width at least 12 inches above the top of the outside barrel of the pipe shall not exceed 12 inches on either side of the pipe.
1. Whenever, for any reason, the maximum trench width is exceeded below the top of the pipe, the Contractor may be ordered by the Authority to cradle or encase the pipe in concrete at the Contractor's expense to ensure the structural integrity of the pipe.
2. If the maximum width of trench specified above cannot be maintained, the Contractor shall install temporary sheeting at his own cost and expense.
3. Where lines are to be constructed on rights-of-way or easements in open areas, the maximum width of trench at the top specified hereinbefore may be exceeded only if the construction is kept entirely within the limits of the right-of-way or easements and can be carried on without damage to adjoining property. The angle of slope shall be the angle at which the trench bank will stand without sliding and in no case shall the angle of slope be steeper than one-half horizontal to one vertical.
4. In locations other than rights-of-way or easements, the Authority may, as warranted by working conditions, and where permitted by Federal or State safety requirements, waive the requirements that the maximum width of trench at the top shall not exceed the dimensions specified hereinbefore.

F. Length of Trench:
1. The Contractor shall limit all trench openings to a distance commensurate with all rules of safety.
2. If the work is stopped either totally or partially, the Contractor shall refill the trench and temporarily repave over the same at his expense and the trench shall not be opened until he is ready to proceed with the construction of the pipeline.

G. Pumping and Draining: The Contractor shall remove by pumping, draining, or otherwise, any water which may accumulate in the trenches and other excavations and shall build all dams and do all other work necessary to keep the trenches or other excavation as free from water as possible.
   1. Where it is impractical to completely drain the trench, special pipe or jointing materials may be authorized.
   2. While the pipelines are being laid, the Contractor shall have sufficient pumping machinery ready for immediate use.
   3. Grade the surface or provide diversion measures in the vicinity of excavation to prevent surface water from entering open trenches or excavations.

H. Accommodations of Drainage: Contractor shall prevent storm or sanitary sewer systems from being obstructed and shall always maintain flows in these pipelines during construction operations. When the material excavated from the trenches must temporarily be placed over open drainage gutters or other waterways Contractor shall install a temporary bridge over the gutters or provide other means for allowing water to flow through.

I. Maintenance of Traffic: Work shall be conducted to cause a minimum of inconvenience to pedestrian and vehicular traffic and to private and public properties along the line of work. It shall be the duty of the Contractor, at all times, to maintain crossings, walks, sidewalks, and other roadways open to traffic and in a satisfactory condition, and to keep all fire hydrants, water valves, fire alarm boxes, and letter boxes accessible for use. Whenever it is necessary to maintain pedestrian traffic over open trenches, a timber bridge at least three feet in width and equipped with side railings shall be provided. When the excavated material will encroach upon sidewalks or private property, planking shall be placed to keep the sidewalk or private property clear of excavated material.
   1. In important thoroughfares, highways, or in narrow streets, the material excavated from the trench shall be removed from the site of the work at the Contractor's own expense to provide suitable space for traffic. The Contractor shall, at his own expense, bring back as much of the approved material as necessary to properly refill the trench; or he shall, at his own cost and expense, furnish such other suitable materials as may be necessary to properly refill the trench.
   2. When it is necessary to haul soft or wet materials over public streets, the Contractor shall provide suitable vehicles and shall conform to all laws and ordinances relevant to such hauling.
   3. Where to keep one side of the roadway free from any obstruction or to keep the material stored alongside the trench from falling on private property outside the right-of-way, a safe and suitable barrier shall be placed alongside the trench.
   4. Refer to Section 01570 for traffic regulations.

J. Blasting and Explosives: The use of explosives shall be governed by Act 362 of 1957, as amended, which regulates the use of explosives in certain blasting operations and confers powers and imposes duties on the Pennsylvania Department of Environmental Protection (DEP) and only used with the approval of the Authority and/or Township.

1. Blasting is not permitted within 500 of any structure unless approved in writing by the Authority and/or Township.
2. The Contractor shall be solely responsible for injury to persons or property located within or beyond the area or scope of the project that may result from the use of explosives.
3. All blasting shall be performed under the supervision of and by individuals who possess current licenses indicating they have successfully passed the required yearly examination prescribed by DEP.
4. Whenever any pipe main or conduit is encountered in the trench, all material within five feet of the same shall be removed by some method other than blasting or as otherwise directed by the owner of the utility.
5. The Contractor shall be responsible for the depths to which all blasting is performed.
6. Should any street paving adjoining any trench be damaged due to the Contractor's blasting operations, Contractor shall immediately cease the blasting operations and repair the damaged street paving; also, Contractor shall not again proceed with any blasting until written approval has been obtained from the Authority.
7. Blasting within State Highway rights-of-way not permitted unless authorized by the PADOT.

K. Protection of Utilities, Property and Structures: The existence and location of underground utilities indicated on the Drawings is to serve as a notification that such utilities exist in the general proximity of the work. Utilities not shown, or not located where shown, shall not relieve the Contractor of the responsibility for their protection during construction.
   1. The Contractor shall notify all utility companies, through the Pennsylvania One Call System, in advance of construction, to locate their facilities in accordance with Pennsylvania Act 287 of 1974, as amended by Act 121 of 2008 (the Act); and shall cooperate with agents of these companies during performance of the Work. Procedures for emergency action and repairs to utilities shall be as established by the Act.
   2. When the Contractor, during the progress of the excavation uncovers pipelines or conduits, which because of injury or age are in poor condition, Contractor shall immediately notify the owner of the utility in order that steps may be taken for replacement or repair. Contractor shall record locations and procedures of repairs made by Contractor.
   3. Refer to Section 02015 for specific requirements for protection and repair of underground utilities.

L. Stream Crossings: Excavate trenches in stream crossings to the depth shown on the Drawings or otherwise required by the Authority.
   1. Material excavated may be used as backfill unless specifically prohibited by any state agency having jurisdiction.
   2. Make all necessary provisions for cofferdaming, dewatering, and removal of excess excavated material.
   3. Always maintain the flow in the stream.

4. Where rock is encountered in the stream crossings, do not use forms to construct the concrete encasement; place concrete on firm rock below the pipe and against firm rock on both sides of the pipe to provide a firm bond between the encasement and the rock. Should the Contractor excavate beyond the dimensions specified herein before for the concrete encasement, he will be required to furnish and place all additional concrete required beyond the dimensions schedule shown on the drawings at his own expense.
5. Construct stream crossings in accordance with requirements indicated on the Drawings or appropriate permit requirements.
6. Construct stream crossings in accordance with any additional requirements specified on the approved Sedimentation and Erosion Control plans.

3.02 PIPE BEDDING AND TRENCH BACKFILL

A. Bedding: The trench shall be excavated to a depth of six (6) inches below the outside diameter of the pipe barrel, or deeper if so specified. The resultant subgrade shall be undisturbed or compacted as approved by the Engineer if disturbed. The bedding shall then be prepared by placing a layer of thoroughly compacted aggregate bedding and initial backfill material, as specified, in uncompacted 4-inch to 12-inches thickness layers above top of pipe. Bedding shall provide uniform and continuous bearing and support for the pipe at every point between bell holes.

B. Special Bedding:
1. Concrete Cradle and Concrete Encasement: If concrete cradle and/or encasement is indicated on the Drawings or required by the Engineer, the trench shall be excavated to a depth of six (6) inches below the outside of the barrel of pipes. All of this excavation may be done by machine. Method of placement is specified in Section 02731.
2. Unstable Subgrade: Where the bottom of the trench at subgrade is found to be unstable or to include ashes, cinders, any type of refuse, vegetable, or other organic material, or large pieces or fragments of inorganic material, which, in the opinion of the Engineer, should be removed, the Contractor shall excavate and remove such unsuitable material to the width and depth recommended by the Engineer.
    a. Before pipe is laid, the subgrade shall be made by backfilling with aggregate material, as directed by the Engineer, in 3-inch (uncompacted thickness) layers thoroughly tamped and the bedding prepared as hereinbefore specified.
3. Special Foundations: Where the bottom of the trench at the subgrade is found to consist of material that is unstable to such a degree that, in the opinion of the Authority, it cannot be removed and replaced with an approved material thoroughly compacted in place to support the pipe properly, the Contractor shall construct a foundation for the pipe in accordance with plans approved by the Authority.
4. Excavation in Fill: When the pipe is laid in fill, the compacted embankment shall be brought to a height of at least 9 inches above the proposed top of the pipe before the trench is excavated.

C. Backfilling Methods:
   1. General: Backfilling shall not be done in freezing weather except by permission of the Engineer, and it shall not be done with frozen material. Do not backfill when the material already in the trench is frozen.
      a. Where aggregate backfill is not indicated on the Drawings or specified herein, and in the opinion of the Engineer or Authority should be used in any part of the work, the Contractor shall furnish and backfill with aggregate as directed.
   2. In State Highways all backfill shall be in accordance with the requirements of PA DOT Chapter 459.
   3. In existing Township streets, all backfill shall be PA DOT 2A stone unless otherwise provided in the Township Street Opening Permit.

D. Pipe Bedding Beneath and to Centerline of Pipe: All trenches shall be backfilled, from the bottom of the trench to the centerline of the pipe. Bedding material shall be deposited in the trench for its full width on each side of the pipe and fittings simultaneously and the full length of the pipe shall be chocked by appropriate methods. The Contractor shall take special care to avoid damaging or moving the pipe.

E. Initial Backfill Over Pipe: From the centerline of the pipe and fittings to a depth of a minimum of one (1) foot above the top of the pipe, the trench shall be backfilled by hand or by approved mechanical methods. The Contractor shall use special care in placing and compacting this portion of the backfill to avoid damaging or moving the pipe. The backfill shall be placed to a depth of one (1) foot minimum above the pipe and compacted by approved mechanical methods.

F. Aggregate Backfill to Restoration Depth (Roadways, Driveways and Other Paved Areas): From one (1) foot above the top of the pipe to restoration depth, the trench shall be backfilled by hand or by approved mechanical methods. Backfill in this section of the trench shall be coarse aggregate material subject to limitations specified and consolidated by approved mechanical methods in layers not exceeding 12 inches unless otherwise specified. Any consolidation method utilizing water such as jetting or puddling shall not be permitted. Consolidation shall proceed from the center of the trench to the sides to prevent arching.

G. Backfill Material to Restoration Depth (Seeded Areas): From one (1) foot above the top of the pipe to restoration depth, the trench shall be backfilled by hand or by approved mechanical methods. Backfill in this section of the trench shall be excavated material subject to limitations specified and consolidated by approved mechanical methods in layers not exceeding 12 inches unless otherwise specified. Any consolidation method utilizing water, such as jetting or puddling shall not be permitted. Consolidation shall proceed from the center of the trench to the sides to prevent arching.

H. Underground Warning Tape: For the purposes of early warning and identification of buried pipes during future trenching or other excavation, provide continuous identification tapes in trenches. Install in accordance with printed recommendations of

the tape manufacturer, and as modified herein. Bury tape at a depth to be determined in the field by the Authority's representative based on field conditions.

1. Provide in trenches for utilities indicated in Part 2.

I. Compacting: During the course of backfilling and compacting work, the Authority may, at any location or depth of trench, make tests to determine whether the Contractor's compaction operations are sufficient to meet specified requirements. Compact trench backfill as follows:

1. All trench excavation and backfill within State Highway right-of-way will be subject to inspection by representatives of the Commonwealth of Pennsylvania, Department of Transportation, and the work must be performed in accordance with the requirements of that department without additional payment even though such requirements may entail more labor or services than the methods herein described.
2. Use mechanical tampers to compact backfill materials in trench refill operations to produce a density of backfill at the bottom of each layer of not less than 95 percent of maximum density obtained at optimum moisture content as determined by AASHTO T99. Perform field determinations of density, when requested by the Engineer, in accordance with AASHTO T191.

3.03 RESTORATION AND CLEAN-UP OF SURFACE

A. Replacement or Restoration of Surface Items: The Contractor shall restore (unless otherwise stipulated) all sidewalks, curbing, gutters, shrubbery, fences, poles, sod or other property and surface structures removed or disturbed as a part of the work to a condition equal to that before the work began, furnishing all labor and materials incidental thereto.

1. Replacement of curbs and sidewalks shall be in full accordance with the materials and methods specified by the Township of Bethlehem, and as detailed on the Drawings.

B. Pavement Replacement: As specified by Township of Bethlehem and as detailed on the approved subdivision Drawings.

C. Clean-Up and Maintenance of Surfaces:

1. General: During construction, the surfaces of all areas including, but not limited to, roads, streets, and driveways shall be maintained daily to produce a safe, desirable, and convenient condition. Streets shall be swept and flushed after backfilling, and recleaned as dust, mud, stones and debris caused by the work, or related to the work again accumulates. Failure of the Contractor to perform this work shall be cause for the Authority to order the work by others, and backcharge all costs to the Contractor/Developer.
    a. All surplus materials furnished by the Contractor and temporary structures shall be removed from the site by the Contractor.

b. All dirt, rubbish and excess earth from the excavation shall be disposed of by the Contractor in a manner and place acceptable to all governing agencies.
c. The construction site shall be left clean at the end of each working day to the satisfaction of the Authority.

2. Repair or Correction of Unsatisfactory Conditions: All unsatisfactory conditions resulting from the work shall be corrected.
   a. Any subnormal or dangerous condition caused by the work, on any surface, shall be repaired or corrected within two hours of observance or notification of its existence. If repairs or corrections are not made within this period, the Authority may cause to have the work completed with the resulting cost being the responsibility of the Contractor/Developer.

D. Restoration of Lawns, Meadows, and Cultivated Fields:
   1. General: Final restoration of all areas shall be performed in accordance with the specifications for the particular land use as herein defined.
      a. Final restoration shall be performed no later than the start of the next planting season following construction. The planting season shall be as established by the U.S. Agricultural Service for the area of construction.
      b. Topsoil shall be screened free from subsoil, brush, weeds, or other litter, clay lumps and stones, but may contain decaying vegetable matter as is present in good topsoil.
      c. Precautions shall be exercised as necessary to conform with laws relating to erosion and sediment control.
      d. Seed shall be not more than two (2) years old. Germination tests of seeds shall be made not more than six (6) months prior to seeding. Seed, which has become wet, moldy or otherwise damaged shall not be used.
      e. All seed mixtures shall be submitted to the Authority for approval prior to seeding.
      f. The Contractor shall be responsible to produce a stand of grass in all seeded or sodded areas. Erosion, drought, or any other condition encountered shall not relieve the Contractor of this requirement.
   2. Lawns: All disturbed areas, whether inside or outside the pay-lines shall receive a minimum of 6-inches of topsoil, and the surface hand raked, stones removed and natural drainage features provided and/or restored prior to the application of seed. The Contractor shall improve all disturbed areas to a condition equal to or better than prior to construction.
      a. The seed shall be sown with approved seeding procedure at the rate of four (5) pounds per 1,000 square feet. An approved starter fertilizer shall be utilized and applied per manufacturer's recommendations. Hydroseed shall be allowed with approved application mixtures.
   3. Pasture and Meadow Grass: Prior to construction, the full depth of the existing topsoil, but no less than 12-inches, shall be stripped from all areas anticipated to be disturbed, and shall be stockpiled during construction. Upon completion of the construction, all topsoil removed shall be replaced. As the final class of material is applied, bringing the area to finished grade, the depth of topsoil replaced shall not be less than the depth removed.

a. The seed shall be sown with approved seeding procedure at the rate of 22 to 25 pounds per acre.

4. Cultivated Fields: Prior to construction, the full depth of the existing topsoil, but no less than 12-inches, shall be stripped from the area of the anticipated trench, and shall be stockpiled during construction.
   a. Upon completion of construction, the entire disturbed area shall be cleaned of all rubbish, stones, and other objects over two (2) inches in maximum dimension, and all crushed stone related to the construction operations.
   b. All disturbed and traveled areas relevant to the work shall be scarified to a depth of ten (10) inches.
   c. All the topsoil removed shall be replaced, and the entire disturbed and traveled areas graded to the original grade. The depth of the topsoil replaced shall not be less than the depth removed.
5. Sod: Sodding shall consist of a grass equivalent to the seeding specified for that particular land use. Sod shall be used where directed by the Authority.
6. Seeding and soil supplement application shall be performed by the hydroseeding method. Rates of application, methods and equipment shall be approved by Engineer prior to commencing with work.
7. Erosion Control/Seed Germination mat shall be applied in accordance with manufacturer's instructions either before or after hydroseeding operations where required or as directed by the Authority.

E. Traffic Signal Systems: Severed, damaged or removed loop detectors, lead-in wires, conduit, junction boxes, etc., shall be repaired within five (5) days. The Contractor shall engage a PA DOT approved traffic signal contractor to perform repairs/restoration. Only PA DOT approved materials shall be used.

END OF SECTION

SECTION 02500

PAVING AND SURFACING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Temporary paving.

B. Permanent paving.

C. Shoulder restoration.

D. Cement Concrete Sidewalks and Curbs.

E. Bituminous Pavements.

F. Guide Rails.

G. Traffic Line Painting.

1.02 RELATED SECTIONS

A. Trenching, Backfilling, and Compacting: Section 02221.

B. Division 3 - Concrete.

1.03 QUALITY ASSURANCE

A. Source Quality Control:
   1. Use materials conforming to requirements of the Commonwealth of Pennsylvania Department of Transportation Specifications Publication 408, latest edition.
   2. Use products of a bituminous concrete producer regularly engaged in production of bituminous concrete conforming to the standards referenced herein.
   3. Maintain quality of work by using products of a qualified bituminous concrete producer and qualified plant operating workmen.

B. Requirements of Regulatory Agencies:
   1. Removal, protection and replacement of paving on State Highways shall be performed in accordance with the requirements of the Commonwealth of Pennsylvania, Pennsylvania Code, Title 67, Transportation, Department of Transportation, Chapter 459, Occupancy of Highways By Utilities, latest edition.

2. Removal, protection, and replacement of paving on State Highways will be subject to inspection by representatives of the Commonwealth of Pennsylvania Department of Transportation.
3. Removal, protection and replacement of paving on streets other than State Highways shall be performed in accordance with the requirements of the Township of Bethlehem "Standard Construction Documents", latest revision.
4. Any conflicts between these specifications and Bethlehem Township requirements shall be resolved in favor of the Township requirements.

1.04 REFERENCES

A. The “PDT Sections” noted herein refer to sections contained in the Commonwealth of Pennsylvania Department of Transportation Specifications Publication 408 latest edition. The references pertain only to materials, construction, equipment, methods and labor. The payment provisions do not apply to work to be performed under this Contract.
   1. PDT Section 301 Plain Cement Concrete Base Course.
   2. PDT Section 309 Superpave Base Course.
   3. PDT Section 401 Plant Mixed HMA Courses.
   4. PDT Section 409 Superpave Mixture Design of Plant Mixed HMA Courses.
   5. PDT Section 460 Bituminous Tack Coat.
   6. PDT Section 491 Milling of Bituminous Pavement Surface.
   7. PDT Section 501 Reinforced or Plain Cement Concrete Pavements.
   8. PDT Section 620 Guide Rail.
   9. PDT Section 630 Plain Cement Concrete Curb.
   10. PDT Section 636 Bituminous Concrete Curb.
   11. PDT Section 676 Cement Concrete Sidewalks.
   12. PDT Section 703 Aggregates.
   13. PDT Section 704 Cement Concrete.
   14. PDT Section 705, Joint Material.
   15. PDT Section 721 Calcium Chloride.
   16. PDT Section 962, Painting Traffic Lines and Markings.

B. Commonwealth of Pennsylvania Department of Transportation Bulletin 25: Specifications for Bituminous Materials.

C. Commonwealth of Pennsylvania Department of Transportation Bulletin 27: Bituminous Concrete Mixtures, Design Procedures, and Specifications for Special Bituminous Mixtures.

D. Commonwealth of Pennsylvania, Pennsylvania Code, Title 67. Transportation, Department of Transportation, Chapter 459, Occupancy of Highways by Utilities, latest version (PA DOT Chapter 459).

E. Commonwealth of Pennsylvania, Pennsylvania Code, Title 67, Chapter 212, Official Traffic Control Devices.

1.05 SUBMITTALS

A. Certificates: Furnish certification from bituminous and aggregate producer attesting those materials conform to requirements of Pennsylvania Department of Transportation Specifications.

1.06 PROJECT CONDITIONS

A. State Highways:
   1. All work within the right-of-way of State Highways shall be performed in strict accordance with the requirements of PA DOT, Title 67, Chapter 459.

B. Protection:
   1. Employ traffic control measures in accordance with the requirements of PA DOT, Title 67, Chapter 212.
   2. Protect paved surfaces outside of the limits of work. Repair pavement outside limits damaged by constructing operations.
   3. The Contractor shall be liable for damages to roads caused by his equipment. The repairs may include lane or full roadway width overlays as directed by authority having jurisdiction over roadway.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Coarse Aggregate Base Course:
   1. Select Granular Material (2RC): Crushed gravel, stone or slag conforming to PDT Section 703.3.

B. Plain Cement Concrete Base Course:
   1. High early strength cement concrete (HES) conforming to PDT Section 704.

C. Bituminous Materials and Pavements:
   1. Asphalt Cement: PG-64-22 conforming to PDT Bulletin 25.
   2. Temporary Paving:
      a. Type 2-P Bituminous Stockpile Patching Material conforming to Section 484 of Bulletin 27.
      b. Bituminous Concrete HMA Base Course (25.0 mm): Conforming to PDT Section 309
   3. Bituminous Concrete HMA Base Course (25.0 mm): Conforming to PDT Section 309; Superpave Volumetric Asphalt Mixture Design Base Course, PG64-22.
   4. Bituminous Tack Coat: Class E-I, E-6 or E-8 emulsified asphalt conforming to PDT Bulletin 25.

5. Binder Course: Hot mixed, hot laid, Bituminous Concrete HMA Binder Course (19.0 mm), Conforming to PDT Sections 401 and 409; Superpave Volumetric Asphalt Mixture Design, HMA Binder Course, PG-64-22.
6. Wearing Course: Hot mixed, hot laid, Bituminous Concrete HMA Wearing Course (9.5 mm), Conforming to PDT Sections 401 and 409; Superpave Volumetric Asphalt Mixture Design, HMA Wearing course, PG64-22.

D. Stabilized Shoulder:
1. AASHTO No. 8 Aggregate: Conforming to PDT Section 703.2, Coarse Aggregate.
2. Bituminous Material: Conforming to PDT Section 470.2.

E. Guide Rail: Type 2-S without rubbing rail, conforming to PDT Section 620.

F. Cement Concrete:
1. For curbs, gutters and sidewalks, Class A conforming to PDT Section 704.

G. Aggregate Surface: Select Granular Material (2RC) conforming to PDT Section 703.3.

H. Bituminous Concrete Curb: Conforming to PDT Section 636.

I. Premolded Expansion Joint Filler Material: Conforming to PDT Section 705.

J. Traffic Paint - State Highways: Conforming to PDT Section 962.2 (b).

PART 3 - EXECUTION

3.01 PREPARATION

A. Pavement Removal:
1. Saw cut and remove existing pavement to neat lines equidistant from the centerline of the trench.
2. Prior to permanent pavement restoration, saw cut and remove trench edge pavement one foot from each edge of trench.
3. Perform milling of the 6:1 skew line transition for State Highway crossings in accordance with PDT Section 491.

B. Subgrade: Backfill and compact trenches per requirements of Trenching, Backfilling and Compacting: Section 02221.

C. At joints between existing pavements and new paving work, the edges of existing pavements shall be cut and neatly trimmed. An application of Crafco Polyflex Type 2 asphalt-based sealer shall be provided at all locations where new bituminous paving joins existing bituminous paving.

3.02 INSTALLATION (REPLACEMENT PAVING)

A. Temporary Pavement:
   1. Install temporary pavement over areas where the pavement has been removed. Install temporary pavement to 2 inches minimum thickness after compaction (cold patch) or 6-1/2" minimum thickness after compaction Superpave 25.0 mm, with top surface flush with surface of adjacent pavement, and maintained until permanent restoration is made.

B. Replacement of Permanent Pavement:
   1. General:
      a. The Contractor shall restore all street paving, shoulders, driveways, and parking areas, including subgrade, and base courses with materials, as specified herein. This includes areas disturbed outside the trench line. Such restoration is for that area removed or broken in the execution of the work or that subsequently fails as a result thereof.
      b. Method of preparing and placing mixture, compaction, and protection of in-place bituminous concrete for pavement shall comply with PDT Sections 309, 401 and 409.
      c. Location of types and thicknesses of replacement pavements are as indicated on the approved subdivision Drawings or in accordance with Bethlehem Township "Standard Construction Documents", latest revision.
   2. Bituminous Concrete HMA Base Course (25.0 mm): Construct in accordance with the requirements of PDT Section 309.
      a. Where roadways receive trench restoration only, install the Superpave Bituminous Concrete Base Course with the top surface below the surface of the adjacent pavement a distance equal to the thickness of the replacement surface course pavement.
      b. Where roadways receive overlay pavement, install the Superpave Bituminous Concrete Base Course with the top surface flush with the surface of the adjacent pavement.
   3. Bituminous HMA Binder Course (19.0 mm): Construct in accordance with the requirements of PDT Section 409, where required by PADOT.
      a. Install binder course, where required, with the top surface below the surface of the adjacent pavement a distance equal to the thickness of the replacement wearing course pavement.
   4. Bituminous Concrete HMA Wearing Course (9.5 mm): Construct in accordance with the requirements of PDT Section 409.
      a. Install wearing course with top surface flush with surface of adjacent pavement.
   5. Plain Cement Concrete Base Course:
      a. Construct in accordance with the requirements of PDT Section 301.
      b. Provide Bituminous Tack Coat over cured cement concrete surface per requirements of PDT Section 460.
      c. Install plain cement concrete base course with top surface level with top of existing concrete base course.

D. Cement Concrete Curbs: Replace curbs to dimensions, shape and workmanship as the original curb unless otherwise indicated on the approved subdivision Drawings. Construction methods specified in PDT Section 630.

E. Bituminous Concrete Curb: Construct in accordance with the requirements of PDT Section 636, or as indicated on the approved subdivision Drawings.

F. Cement Concrete Sidewalk: Replace cement concrete sidewalk removed or disturbed in accordance with Township requirements; width to match existing. Construct bed and concrete surface as specified in PDT Section 676.

G. Bituminous Concrete Driveway: Restore to a condition equal to its original undisturbed condition using the same type and quality of materials as that of the driveway restored.

H. Bituminous Concrete Walk: Consists of an aggregate base course and a bituminous concrete wearing course. Aggregate base shall not be less than 6 inches thick after compaction with top surface not less than 2 inches below the surface of the adjacent existing paving. The bituminous concrete wearing course shall consist of a 2-inch thick wearing course of 9.5 mm bituminous concrete with top surface flush with the surface of the adjacent existing paving.

I. Stone Driveway: Restore to a condition equal to its original undisturbed condition using the same type and quality of materials as that of the driveway restored.

J. State Highway Guide Rail: Replace guide rail that is damaged or removed during construction.
   1. Work must be performed to the requirements and satisfaction of the Pennsylvania Department of Transportation.

K. Dust Control: Provide effective dust control by sprinkling water, using calcium chloride or by any other methods approved by the Authority. Use dust control measures where, when and in a manner required by the Authority.

L. Roadway Traffic Lines and Markings: Apply in accordance with PDT Section 962.

M. Parking Area Traffic Lines and Markings: Striping shall consist of white four-inch wide painted lines of length and spacing indicated on the Drawings. Paint lines accurately with sharp, clearly defined edges. Paint solid-colored areas free of skips and holidays. Make linework straight and uniformly spaced.

N. Provide satisfactory barrier cones for at least 30 minutes, or until the paint is dry and track free from vehicular traffic. Repaint marked or damaged areas, as directed.

3.03 INSTALLATION (OVERLAY PAVING)

A. Provide overlay to limits indicated on the approved subdivision Drawings or as required by the applicable governing agency.
   1. Use materials, composition of mixture, and methods to construct the bituminous concrete overlay paving conforming to all applicable requirements of PDT Section 409 for Superpave Bituminous HMA Wearing Course. (9.5 mm).
   2. The thickness of the overlay pavement after compaction shall be 1½ inches minimum.
   3. Perform milling of existing paving surface, where required, in accordance with PDT Section 491.

3.04 CLEAN-UP AND MAINTENANCE

A. During construction, surfaces of all areas including, but not limited to, roads, streets, and driveways shall be maintained on a daily basis to produce a safe, desirable, and convenient condition.
   1. Streets shall be swept and flushed after backfilling, and recleaned as dust, mud, stones and debris caused by the work, or related to the work again accumulates.
   2. Failure of the Contractor to perform this work shall be cause for the Authority to order the work to be done by others, and backcharge all costs to the Contractor.

B. Repair or Correction of Unsatisfactory Conditions: All unsatisfactory conditions resulting from the work shall be corrected.

C. Continuously maintain temporary pavement until it is replaced with permanent pavement.

D. Any subnormal or dangerous condition caused by the work, on any surface, shall be repaired or corrected within two hours of observance or notification of its existence. If repairs or corrections are not made within this period, the Authority may cause to have the work completed with the resulting cost backcharged to the Contractor.

END OF SECTION

SECTION 02601

MANHOLES
FOR SANITARY SEWER SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Cast-in-place and precast concrete manholes.

1.02 RELATED SECTIONS

A. Trenching, Backfilling and Compacting: Section 02221.

B. Gravity Wastewater Sewer: Section 02731.

C. Division 3 - Concrete.

1.03 QUALITY ASSURANCE

A. Shop Inspection:
   1. All materials furnished by the Contractor shall be certified by the supplier for compliance with the pertinent specifications. Shop inspections and testing may be required. The cost of shop testing shall be borne by the supplier or the Contractor.

B. Field Inspection:
   1. All materials shall be furnished and installed and tested for defects in material and/or workmanship in the manner specified and in the presence of and as approved by the Authority.

C. Source Quality Control:
   1. Maintain uniform quality of products and component compatibility by using the products of one manufacturer in the case of precast reinforced concrete manholes.
   2. Obtain certificate of construction compliance with ASTM C478 from the precast reinforced concrete manhole manufacturer. Submit same certificate as part of required submittals.
   3. Obtain certificate of material compliance with ASTM A48, Class 30 tensile strength from the manhole frame and cover manufacturer. Furnish certification that tensile test bars were from same pour as castings. Submit same certificates as part of required submittals.

4. All products installed within PennDOT (PDT) right-of-way shall be certified in accordance with PDT Publication 35 (Bulletin 15).

1.04 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM A48, Gray Iron Castings, Spec. for.
   2. ASTM A276, Stainless and Heat-Resisting Steel Bars and Shapes, Spec. for.
   3. ASTM A307, Carbon Steel Externally Threaded Standard Fasteners, Spec. for.
   4. ASTM A615, Deformed and Plain Billet-Steel Bars for Concrete Reinforcement, Spec. for.
   5. ASTM C270, Mortar for Unit Masonry, Spec. for.
   6. ASTM C361, Reinforced Concrete Low-Head Pressure Pipe, Spec. for.
   7. ASTM C443, Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets, Spec. for.
   8. ASTM C478, Precast Reinforced Concrete Manhole Sections, Spec. for.
   9. ASTM C923, Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes.
   10. ASTM D2240, Rubber Property-Durometer Hardness, Test Method for.
   11. ASTM D4101, Plastic Injection and Extrusion Materials, Spec. for.

B. American Association of State Highway and Transportation Officials (AASHTO) Standards as referenced throughout these Specifications.

C. American Water Works Association (AWWA):
   1. AWWA C302, AWWA Standard for Reinforced Concrete Water Pipe-Noncylinder Type, Not Prestressed.

D. Federal Specifications:
   1. Fed. Spec. SS-S-210A, Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints (Type 1 Rope Form).

1.05 SUBMITTALS

A. Shop Drawings and Product Data:
   1. Manufacturer's 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.

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.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

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

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

1.07 SITE CONDITIONS

A. Environmental Requirements:
1. In no instance 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 to requirements of Division 3 - Concrete.

B. Waterproofed Mortar: Material composition meeting requirements of ASTM C270, Type M with waterproofing admixture included.
1. Medusa Cement Company; Medusa Waterproofing Paste or Powder.
2. Grace Construction Materials; Hydratite
3. Chem-Master Corporation; Hydrolox.
4. Or Equal.

C. Epoxy Bonding Compound: Use product such as A. C. Horn EPOXTITE BINDER; Sika Chemical SIKADUR-HI-MOD or equal.

D. Manhole Steps: Spacing as indicated on Drawings.

1. Reinforced Plastic Step: Composed of a 1/2-inch Grade 60, ASTM A615 deformed steel reinforcing bar completely encapsulated in copolymer polypropylene compound conforming to ASTM D4101.
    a. Acceptable Manufacturers:
        1) M. A. Industries, Inc.
        2) Lane Manhole Steps.
        3) Or Equal.

E. Manhole Frame and Cover: Gray iron castings conforming to ASTM A48, Class No. 35, designed for AASHTO Highway Loading Class HS-25. Provide castings of uniform quality, free from blowholes, porosity, hard spots, shrinkage distortion or other defects. All castings shall clearly display the manufacturer's name, product number, date of pour, and country of origin. Frame and cover design and dimensions equal to Product No. 104510 (frame) and 104116 (cover), manufactured by East Jordan Iron Works. **No substitutions allowed.**
    1. Finish: Bearing and exposed surfaces machined to prevent rocking and rattling under traffic.
    2. Identification: Cast the word**s** "SANITARY SEWER" and "BTMA" integrally on cover in 2-inch size raised letters.
    3. Frame Hold-down Bolts: ASTM A307. Provide four (4) per manhole.
    4. Cover Gasket: One-piece 0-ring gasket factory installed in a machined rectangular or dovetail groove in the cover bearing surface.
        a. Gasket material of neoprene composition having good abrasion resistance low compression set, Type D 40 durometer hardness determined in accordance with ASTM D2240 and suited for use in sanitary sewer manholes.
        b. Gluing of gasket is not permitted.

F. Watertight Manhole Frame and Cover: Gray iron castings conforming to previously specified requirements for Manhole Frame and Cover with the addition of cover hold-down bolts. No manhole insert required for watertight manholes. Frame and cover design and dimensions equal to East Jordan Iron Works Product No. 104517. **No substitutions allowed.**
    1. Cover Hold-down Bolts: Type 316 stainless steel, ASTM A276, bolts and washers; or manufacturer's standard bronze bolts and washers.

G. Preformed Plastic Sealing Compound: Fed. Spec. SS-S-210A, Type 1, Rope Form, of either bitumastic base compound or butyl rubber base compound and shipped protected in a removable two-piece wrapper. Size cross-section of rope form to provide squeeze-out of material around entire interior and exterior circumference when joint is completed.
    1. Henry Sealants Division; RUB'R-NEK.
    2. Press-Seal; EZ-STIK.
    3. Conseal: CS-102B.
    4. Or equal.

H. Waterstop: Gasket type waterstop composed of EPDM or polyisoprene compound, ASTM C923 with stainless steel take-up clamps.
   1. Acceptable Manufacturer:
      a. Kor-N-Seal I
      b. Press-Seal Gasket Corporation.
      c. Dual Seal II

I. Manhole Inserts
   1. General: The manhole insert shall be manufactured from corrosion proof material suitable for atmospheres associated with wastewater collection systems.
   2. Materials: The insert shall be made from High Density Polyethylene Copolymer material that meets ASTM Specification Designation D 1248 Glass A, Category 5, Type III. (The insert shall have a minimum impact brittleness temperature of 105^{o} F or less.) The thickness shall be a uniform 1/8 inch or greater. The insert shall be manufactured to the dimensions as shown on the Drawings to allow easy installation within the manhole frame. The insert shall be fit with a nylon lifting strap for removal.
   3. Venting: The insert shall have a system of relieving pressure from the manhole or relieving a vacuum in the manhole. The venting system shall contain NO moving parts which could be affected by grit accumulations nor have any parts subject to corrosion. The venting system shall not allow water to completely fill the insert, which during freezing weather could freeze and lift the manhole cover.
   4. Manufacturer: The insert shall be manufacture by Parson Environmental Products, Inc., P.O. Box 4474, Reading, PA 19606, or equal.

2.02 PRECAST REINFORCED CONCRETE MANHOLE COMPONENTS

A. Materials and Construction: Conforming to requirements specified in ASTM C478 except as follows:
   1. Concrete: Composition and compressive strength conforming to ASTM C478 except use Type II 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 C302.
   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 the Standard Details.
   4. Manhole Component Seals: Manhole component joints factory formed for self-centering concrete-to-concrete bearing employing preformed plastic sealing compound. Preformed Plastic Sealing Compound: As specified previously.
   5. Manhole Component Design: Base, tapered and straight riser section, and top section dimensions and diameters, not consistent with ASTM C478, are as indicated on the Standard Details.

B. Pipe Openings: Custom preformed during manufacturing in each base and riser section requiring such, to accommodate type of pipe and pipe opening seal provided.
   1. Pipe Opening Seals: Resilient gasket type, cast integrally with manhole component conforming to requirements specified in ASTM C923 and of the following acceptable manufacturers:
      a. Press-Seal Gasket Corporation.
      b. A-LOK Products Corporation; A LOK Manhole Pipe Seal.
      c. Thunderline Corporation; LOCK-SEAL Modular Wall and Casing Seal.
      d. Dual Seal Gaskets Inc.; DUAL SEAL II.
      e. NPC, Inc., Kor-N-Seal I Flexible Pipe to Manhole Connector

C. Precast Top Sections: Designs as required by the Standard Details, of materials and construction as specified previously except additional and differing requirements as follows:
   1. Hold Down Bolt Inserts: Factory cast in top section no less than two 3/4-inch threaded inserts or slotted inserts to accommodate manhole frame hold down bolts. Threaded inserts of 3-inches depth. Both insert types designed for an ultimate load in tension of 12,500 pounds. Inserts factory plugged for shipping. Coordinate insert location with manhole component manufacturer to assure proper location in top sections.
   2. Flat Slab Tops: Tops factory formed to properly accept and support required manhole frame and cover and formed to join riser section in a matching joint.
   3. Eccentric Cone Tops: Manufacture to same minimum wall thickness and with same area of circumferential steel reinforcement as riser sections.

D. Precast Grade Rings: Leveling and adjusting units of 3-inches or 4-inches thickness of materials and construction as specified previously. Factory cast grade rings with hold down bolt holes matching location of same in manhole frame. Design must provide for full bearing of manhole frame.

E. Coatings:
   1. Prepare surfaces to be coated in accordance with the written instructions of the coating manufacturer, including cleaning, sandblasting or acid etching, as necessary.
   2. Coat precast components at the factory.
   3. Interior and Exterior Surface Coating: Use NSF approved epoxy, 20-mil dry film thickness. Interior color shall be white and exterior color shall be beige or green.
      a. Coating shall be specifically designed for the use on precast concrete manholes.
      b. Coating shall be Tnemec Hi-Build Epoxoline, Sherwin Williams Macropoxy 646, or equal.
   4. Interior Liner: Use on force main discharge manholes and the first four manholes downstream of the discharge manhole, or where otherwise directed by the Authority or Engineer.
      a. Liner shall provide a continuous impermeable lining to shield precast concrete against deterioration caused by corrosive atmosphere.

b. Liner shall be factory installed on all new manholes so designated.
c. Channels, benches, and all penetrations through liner shall receive factory-applied corrosion-resistant coating.
d. Liner shall be Terre Hill AGRU Sure Grip Liner and GU base liner, A-LOK Dura Plate 100 or approved equal.

PART 3 - EXECUTION

3.01 INSPECTION

A. Inspect precast reinforced concrete manhole components in accordance with requirements of ASTM C478 regarding repairable defects and defects subject to rejection by the Authority.

B. All material found during the progress of the work, either before or after installation, to have cracks, flaws or other defects will be rejected by the Authority. All defective materials furnished by the Contractor shall be promptly removed from the site.

3.02 PREPARATION

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

B. Earthwork: Perform earthwork for manhole installation as previously specified in Trenching, Backfilling and Compacting: Section 02221.

3.03 MANHOLE CONSTRUCTION METHODS

A. Cast-In-Place Concrete Manhole Base: Construct in accordance with design and dimensions indicated on the Standard Details. When necessary to construct wider or deeper manhole bases than indicated or specified, build such bases as required by the Engineer.
   1. Form and pour concrete in accordance with requirements of Division 3 - Concrete. Additional requirements as follows:
      a. Vibrate poured concrete using mechanical vibrator of a type and design approved by Authority. Use vibrators of type capable of transmitting vibration to concrete in frequencies of not less than five thousand impulses per minute.
      b. Form and pour joint monolithically in manhole base top to match joint of adjoining precast riser section. Use template as obtained from precast concrete manhole component manufacturer of manhole components used in the Project.
      c. Do not place precast riser sections on cast-in-place bases for a minimum of 48 hours after pour.

2. Install sewer piping in cast-in-place manhole bases prior to pouring the concrete.
    a. Apply Epoxy Bonding Compound in accordance with manufacturer's instructions to pipe at base connection prior to pouring the concrete.
    b. Install PVC Waterstop on pipes entering and leaving manhole base prior to pouring concrete. Install PVC Waterstop in accordance with manufacturer's written instructions.
3. Use 4000 psi concrete as specified in Section 03300, unless indicated otherwise on Drawings.
4. Coat bases in accordance with the requirements for precast manhole components.

B. Precast Concrete Bases: Install bases on a 6-inch deep compacted layer of aggregate meeting requirements of Pipe Bedding as specified previously in Section 02221.
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 after pipe connection is made, fill such annular spaces with and/or apply non-shrink grout.
    a. Tightly caulk sealing compound into annular spaces, completely filling the spaces, and render the installation watertight.
    b. Following sealing compound or grout installation, surface will be smooth and flush with interior face of manhole.

C. Concrete Channel Fill: Field pour concrete channel fill for each manhole base.
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. Make slopes gradual outside the invert channels.
6. Use 3000 psi concrete as specified in Section 03300.
7. Precast concrete channels are acceptable if they meet the above requirements.

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 preformed plastic sealing compound in accordance with manufacturer's recommendations and join sections also in accordance with written instructions of manhole component manufacturer.
    a. Prime joint surfaces if required by preformed sealing compound manufacturer.
    b. If sealing compound is installed in advance of section joining leave exposed half of two-piece protective wrapper in place until just prior to section joining.
    c. Use preformed sealing compound as the sole element utilized in sealing section joints from internal and external hydrostatic pressure.
    d. Following manhole section installation, trowel sealing compound surface smooth and flush with interior face of manhole.

e. Make pipe connections into manhole walls as specified previously for pipes connecting into manhole bases.

E. Lifting Hole Sealing: Seal with properly designed tapered rubber plugs. Drive plugs into holes in such manner to render holes completely water and airtight. Sealing of lifting holes with grout not permitted.

F. Frame and Cover Installation: Where required, make final adjustment of frame to elevation using the following:
1. Precast Grade Rings:
a. Set precast grade rings in Water-Proof Mortar. Mortar thickness not to exceed 3/4-inch maximum and 3/8-inch minimum. Wet, but do not saturate precast grade rings immediately before laying.
b. Pre-set grade rings to proper plane and elevation using wedges or blocks of cementitious material not exceeding one square inch wide on all sides. 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.
2. Bolt manhole frames in place on manhole top section, or on leveling units if required, after installing 1/2-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.
3. Use bolts of sufficient length to properly pass through leveling units, if any, engage full depth of manhole top section inserts and allowing enough threaded end to pass through manhole frame to properly tighten nut and washer. Tighten manhole frame bolts after mortar has cured.
4. Install plastic insert. After installation of the insert, the top of manhole cover shall be flush with the top of the frame.

G. Pipe Openings for Future Connections: Openings in manholes where such openings are required for future pipe connections shall be provided with a minimum 3-foot length of PVC pipe and a PVC plug.
1. Install such materials to meet testing limits and to allow future removal without damage to manhole.

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

3.04 INTERFACING EXISTING CONSTRUCTION

A. Connections To Existing Sewers: Where new manholes are constructed on existing sewers, the Contractor shall have the option to use cast-in-place manhole bases or precast bases, both as specified previously.

1. Replace broken or damaged pipe resulting from this work with new pipe. New pipe material shall match existing. Use compatible joint materials or solid sleeve repair couplings, wherever possible. Flexible pipe coupling shall be used only as necessary.
2. Connect new pipe to new manhole bases or new in-line structures as specified previously.
3. If precast manhole bases are used, replace existing sewer pipe with new pipe to first joint outside the manhole base.
4. Maintain flow in existing sewer both during construction operations and until concrete is cured both in the case of cast-in-place work and formed inverts.
5. Cut piping to be removed with a saw. Chipping or breaking pipe with a hammer not permitted.

B. Connection to Existing Sewer Manholes: Where new sewers connect to existing manholes, Contractor shall connect to the existing manhole in such a manner as to not damage the existing manhole or existing sewer pipes and obtain a watertight connection.
1. Contractor shall core bore an opening in the wall of the manhole. Chipping or breaking manhole with a hammer not permitted. Diameter of opening shall be sufficient to accommodate the outside diameter of the new pipe and waterstop.
2. Install a waterstop in the opening in accordance with the manufacturer's instructions.
3. Insert the new pipe in the opening and tighten the clamps on the waterstop around the pipe.
4. Form a flow channel inside the manhole for the new pipe. Flow channel shall match the existing flow channel inside the manhole. Form the channel as previously specified.
5. After connection is made, install a watertight plug until substantial completion to prevent flow and debris from entering the existing system.

3.05 FIELD QUALITY CONTROL

A. General: Test each manhole constructed in the Project by one of the methods specified herein. If the manhole is constructed on an existing sewer where sewage flow must be maintained, the test may be waived at the discretion of Authority.
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 such manhole does test satisfactorily.
3. Provide tools, materials (including water), equipment and instruments necessary to conduct 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 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 subject to Engineer's approval.
4) Provide seal plate with vacuum piping connections for inserting in manhole frame.

4. Prior to testing manholes, thoroughly clean such and seal openings, both to complete satisfaction of the Authority. Seal openings using properly sized plugs.
5. Perform testing with frames installed. The joint between the manhole and the manhole frame shall be included in the test.
6. The Contractor may elect to make a test prior to backfilling for his own purposes; however, the tests of the manholes for acceptance shall be conducted after the backfilling and base course paving (if applicable) have 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 10 inches of mercury and close the valves.
3. Consider manhole acceptable when vacuum does not drop below 9 inches of mercury for the following manhole sizes and times:
   a. 4-foot diameter - 60 seconds.
   b. 5-foot diameter - 75 seconds.
   c. 6-foot diameter - 90 seconds.

C. Repair and Retest: Determine source(s) of leak(s) in manholes failing acceptable limits.
1. Repair or replace defective materials and workmanship 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 must meet with Authority's approval prior to use.

END OF SECTION

SECTION 02731

GRAVITY WASTEWATER SEWER
FOR SANITARY SEWER SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Wastewater Sewer Gravity Pipelines.

B. Service Connection Piping.

C. Pipeline Testing.

1.02 RELATED SECTIONS

A. Trenching Backfilling and Compacting: Section 02221.

B. Cast-In-Place Concrete: Section 03300.

C. Grout: Section 03600.

1.03 QUALITY ASSURANCE

A. Source Quality Control:
   1. Shop Tests and Inspection:
      a. All material furnished by the Contractor shall be certified by the supplier for compliance with the pertinent specifications. Shop inspections and testing may be required. The cost of shop testing shall be borne by the supplier or the Contractor.

B. Disposition of Defective Material: All material found during the progress of the work, either before or after installation, to have cracks, flaws or other defects will be rejected by the Authority. All defective materials furnished by the Contractor shall be promptly removed by him from the site at his own expense.

C. All products installed within PennDOT (PDT) right-of-way shall be certified in accordance with PDT Publication 35 (Bulletin 15).

1.04 REFERENCES

A. American National Standards Institute (ANSI):
   1. ANSI A21.4, Cement-Mortar Lining for Cast Iron and Ductile-Iron Pipe and Fittings for Water.
   2. ANSI A21.10, Gray-Iron and Ductile-Iron Fittings, 2 through 48 inches, for Water and Other Liquids.
   3. ANSI A21.11, Rubber Gasket Joints for Cast Iron and Ductile Pressure Pipe and Fittings.
   4. ANSI A21.50, Thickness Design of Ductile-Iron Pipe.
   5. ANSI A21.51, Ductile-Iron Pipe, Centrifugally Cast, in Metal Molds or Sand-Lined Molds for Water or Other Liquids.

B. American Society for Testing and Materials (ASTM):
   1. ASTM D2321, Underground Installation of Flexible Thermoplastic Sewer Pipe, Rec. Practice for.
   2. ASTM D2564, Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
   3. ASTM D3034, Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings, Spec.
   4. ASTM D3212, Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals, Spec. for.
   5. ASTM F477, Elastomeric Seals (Gaskets) for Joining Plastic Pipe, Spec. for.
   6. ASTM F679, Polyvinyl Chloride (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.

C. American Water Works Association (AWWA):
   1. AWWA C600, Installation of Gray and Ductile Cast-iron Water Mains and Appurtenances.

D. Federal Specifications:
   1. Fed. Spec. SS-S-210A, Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints (Type 1 Rope Form).

1.05 SUBMITTALS

A. Shop Drawings and Product Data: Furnish completely dimensioned shop drawings, catalog cut or other data as required to provide a complete description of piping and piping specialties.

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 pipe will be manufactured in accordance with specified reference standards for each pipe type.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

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

1.07 SITE CONDITIONS

A. Environmental Requirements:
   1. Keep trenches dewatered until pipe joints have been made and concrete cradle or encasement, if any, have cured.
   2. Under no circumstances lay pipe in water or on bedding containing frost.
   3. Do not lay pipe when weather conditions are unsuitable, as determined by the Authority, for pipe laying work.

PART 2 - PRODUCTS

2.01 SEWER PIPE AND FITTINGS

A. For pipe joints, use rubber gaskets suitable for conveying domestic sewage.

B. Ductile Iron (DIP): Use only where approved by Authority.
   1. Pipe: ANSI A21.50 and ANSI A21.51.
   2. Wall Thickness Class (Buried): Class 52.
   3. Cement Mortar Lining: Conforming to ANSI Specification A21.4 or AWWA C104, Latest Edition, except the thickness of linings should not be less than the following:
      a. 3" through 12": 1/8"
      b. 14" through 24": 3/16"
   4. Fittings: Gray iron or ductile iron ANSI A21.10. Fittings larger than 48 in. AWWA C100 Class B.
   5. Joints:
      a. Rubber-Gasket Joints (Buried): ANSI A21.11.
         1) For buried pipe installation, provide push-on joints except where other types of joints are required by the Authority.
   6. Pipe and Fittings Coating: Factory coated inside and out with bituminous material; minimum 1 mil dry thickness. Bituminous material and finished coat conforming to seal coat requirements in ANSI A21.4.

C. Polyvinyl Chloride Pipe (PVC):
   1. Pipe: Type PSM SDR-35, ASTM D3034 or ASTM F679 for pipe over 15” diameter.

2. Fittings: Conforming to same applicable ASTM Specification requirements for pipe.
3. Joints: Push-on with elastomeric gasket, ASTM D3212; and ASTM F477 for gasket specifications.

D. PVC Waterstop for connection to existing manhole: Gasket type waterstop composed of virgin polyvinyl chloride (PVC) such as manufactured by Fernco Joint Sealer Co.; CMA Concrete Manhole Adapter.

E. Pipe Couplings: Solid sleeve couplings shall be used wherever possible. Flexible couplings of clamped design with virgin PVC coupling and two type #305 stainless steel bands, such as manufactured by Fernco Joint Sealer Co. may be used in lieu of solid sleeve couplings only as necessary and with approval of the Authority. Use for repairs to existing sanitary sewers.

2.02 SERVICE CONNECTION PIPE AND FITTINGS

A. Ductile Iron Pipe (DIP): As specified for Sewer Pipe and Fittings; 6-inch diameter.

B. Polyvinyl Chloride Pipe (PVC): As specified for Sewer Pipe and Fittings; 6-inch diameter.

C. Saddles (PVC): Correctly contoured for outside diameter of pipe and incorporating ring gasket bell outlet.
1. Wye or tee saddle of same material as specified previously for Sewer Pipe.
2. Solvent Cement: ASTM D2564.

D. Pipe Plugs: Designed for permanent installation and removable. Obtain Plugs for various types of pipe used from the respective pipe manufacturer.

PART 3 - EXECUTION

3.01 PREPARATION

A. Earthwork: Perform earthwork for sewer installation as specified in Trenching, Backfilling, and Compacting: Section 02221.

3.02 PIPE LAYING

A. General: All pipe shall be laid to a uniform line and grade between manholes, socket ends upgrade, with a firm and even bearing along the barrel of the pipe, close joints and smooth invert. The spigot end of the pipe is to be centered in, shoved tight and secured against the bell or socket of the previously laid pipe. The interior of each pipe shall be

cleaned of all excess joint and foreign material before the next pipe is laid. The pipe shall be laid in the bedding materials as specified in Section 02221. Pipe-laying shall commence at the lowest point and proceed upgrade. At the close of each day's work, and at such other times when pipe is not being laid, the open end of the pipe shall be protected with a close-fitting stopper.

B. Joints: Make joints in joining of pipe materials specified under PART 2 and not specifically covered for installation under PART 3 of this Specification, in strict accordance with manufacturer's installation instructions.

C. Laying Specified Types of Plastic Pipe: Installation and joint assembly according to ASTM D2321.

D. Laying Ductile Iron Pipe: Installation and joint assembly according to AWWA C600, and as follows:
   1. Where necessary to field cut pipe use approved pipe cutter, milling cutter or abrasive wheel saw.
   2. Make joints as specified previously under "Joints."

E. Construction Control: The trench and every pipe laid shall be tested as to grade and alignment. The use of laser equipment is required. Contractor shall provide verification of grade as work progresses. Unless otherwise approved by the Authority, the pipe grade for laterals shall be a minimum of 1/4 inch per foot. Pipe not laid to proper line and grade will be removed and reconstructed at the Contractor's expense.

F. Variations: The Authority reserves the right to vary the line and/or grade from that shown on the drawings for pipelines and manholes when such changes may be necessary or advantageous.

G. Handling of Sewer Line Materials into Trench: Proper implements, tools and facilities satisfactory to the Authority shall be provided and used by the Contractor for the safe and convenient prosecution of the work. All pipe, fittings, jointing materials, etc. shall be carefully lowered into the trench piece-by-piece by means of a derrick, ropes, or other suitable tools or equipment, in such a manner as to prevent damage to sewer line materials and/or workmen. Under no circumstances shall such materials be dropped or dumped into the trench.

H. Pipe Clearance in Rocks: Ledge rock, boulders and large stones shall be removed to provide a clearance of at least 6 inches below and on each side of all pipe and fittings. The specified minimum clearance is the minimum clear distance, which will be permitted between any part of the pipe and/or fitting being laid and any part, projection or point of such rock, boulder or stone.

I. Connections to Existing Manholes or Structures: Cut required opening or openings by core boring to prevent cracking and spalling concrete. Make openings of sufficient size to accommodate pipe with PVC Waterstop installed and one inch of annular grout space.

Grout annular space using Non-Shrink and Non-Metallic Grout. Make connection watertight. Form a new invert channel in the existing manhole base to properly conduct the flow through the existing manhole. Install a watertight plug in the pipe so as not to permit ground water, surface water or debris to enter the existing facilities through the new connection. Maintain watertight plug until substantial completion.

J. Drop Connections: Make drop connections where indicated on the Drawings, where drop in invert is two feet or more or as required by the Authority. Use same pipe material used to construct the main from which the drop connection is made. Construct drop connection in accordance with design shown on the Standard Details.

K. Concrete Cradle and Encasement:
   1. Preparation: Prior to the formation of cradle or encasement, if any, temporary supports consisting of timber wedges and solid concrete bricks or cap blocks shall be used to support the pipe in place. Temporary supports shall have minimum dimensions and shall support the pipe at not more than two locations, one at the bottom of the barrel of the pipe adjacent to the shoulder of the socket and the other near the spigot end.
   2. Placing: After jointing of the pipe has been completed, concrete shall be uniformly poured beneath and on both sides of the pipe. Placement shall be done by the use of suitable equipment. The concrete shall be wet enough during placement to permit its flow, without excessive prodding, to all required points around the pipe surface. The width of cradle shall be such as to fill completely the trench width. In case of extremely wide trenches, concrete encasement may be confined above the top of the pipe to a narrower width but in no case shall it be less than the width of trench required for the size of pipe being used. Before depositing concrete, the space within the limits of the pour shall have been cleared of all debris and water. Water shall not be allowed to rise adjacent to, or flow over, concrete deposited for less than 24 hours. Concrete shall be protected from the direct rays of the sun and kept moist, by a method acceptable to the Authority, for a period of seven days or until backfilling is begun. In no case shall backfilling begin within 24 hours of the time of placing and the Authority shall have strict control of the rate of backfilling.
   3. Concrete: 3000 psi per requirements of Section 03300.

3.03 SERVICE CONNECTIONS

A. Fittings (Wyes and Tee-Wye branches, risers and bends) and service pipe shall be provided in strict accordance with these specifications and all practices and precautions required for the sewer main are equally applicable to the service connections from the sewer to the right-of-way line, or to a location designated by the Authority. The Contractor shall place a 2" x 2" wooden marker at the end of each sewer lateral. The marker shall be one piece and may not be constructed from two or more smaller pieces. The marker shall extend from the lateral invert to 12" above grade.

B. The Contractor shall submit to the Authority, at the Project completion, all as-built information which shall include: manhole run, station from downstream manhole, length

from centerline of sewer, invert elevation at the termination point of lateral and the lot number, address or property owner's name for whom the lateral is provided.

C. If rock is encountered during the installation of the lateral, the Contractor shall extend the lateral to the required distance as specified elsewhere in these specifications, and he shall provide a minimum "rock-free" distance of one foot beyond the end of the lateral. No lateral shall be "butted" against rock.

D. Plugs: Close free ends of branches and service connections with a carefully fitted plug manufactured for use with the pipe material. Installed plugs shall successfully pass Line Acceptance Tests.

E. The Authority may require the installation of underground electronic marker balls at the end of laterals. Such marker balls will be provided to the Contractor by the Authority. Contractor shall be charged a fee for each marker ball at the Authority's actual cost per ball.

3.04 TESTS

A. Deflection Test
   1. Deflection tests shall be successfully performed on all PVC pipelines by means of a mandrel test.
   2. The Contractor shall utilize a 5% deflection mandrel to ensure that PVC pipe allowable deflection during installation has not been exceeded. Mandrel test shall be conducted no earlier than 30 days after compaction of backfill of the test section of pipe.
   3. Mandrel Test Procedure
      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. (A nylon ski rope is recommended).
      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 pipe.
      d. Connect a retrieval rope to the back of the mandrel to pull it back if necessary.
      e. Remove all the slack in the pull rope and place a tape marker on the rope at the ends of the pipe.
      f. Draw mandrel through the sewer line. If any irregularities or obstructions 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 damaged pipe is found, it shall be replaced at the Contractor's expense; if pipe is not damaged, replace and thoroughly tamp the haunching and initial backfill; replace remainder of backfill.
      h. Re-test this section for deflection.

B. Leakage Tests:

1. Air Testing: The Contractor shall test each section of sewer between manholes and all laterals to the limit of this contract using low-pressure air. Testing shall not be performed for a period of thirty (30) days after backfilling has been completed, and not prior to completion of construction of all other utilities within the cartway**.** The Contractor may, at his option, test the section of sewer for his own purposes, prior to that time; however, the requirements of this subsection shall not be deemed to be completed until the lines have been fully tested as per this section.
2. A minimum of two minutes shall be provided to allow equilibrium of the air temperature with pipe wall before test readings shall commence. The rate of air loss shall be determined by measuring the time interval required for the average internal pressure to decrease by 1.0 psig.
3. The initial test pressure to be developed in the sewer and laterals shall be 5 psi.
4. The pipe shall be considered acceptable if the air loss rate does not decrease 1.0 psig over a minimum test period of 4 minutes.
5. If the above rate of leakage is exceeded, the Contractor shall, at his expense, determine source of leakage and make all necessary corrections and retest.
6. The Contractor shall submit to the Engineer for approval the detailed test procedure and list of test equipment he proposes to use prior to testing.

C. Infiltration:

1. After the air testing described in the preceding paragraph has been completed by the Contractor, regardless of any indications of the test results made by the Authority, the Authority reserves the right to perform field investigations, prior to final written acceptance of each sewer run by the Authority during the maintenance period specified elsewhere in these specifications, to establish the leakage of groundwater into the sewer and laterals constructed under this contract.
2. Should the leakage exceed 100 gallons per day per inch diameter per mile of pipe for any section, the Contractor shall, at the direction of the Authority, and at no cost to the Authority, perform any additional testing or corrective work required to reduce the infiltration in each manhole run from those lines installed by the Contractor to less than 100 gallons per day per inch diameter per mile of pipe. This leakage applies to each manhole run separately and should not be construed to mean total leakage in the total system. The scope of this corrective work shall include, but not be limited to, cleaning, televising and testing the sewer and laterals to the limits installed by the Contractor, to include testing and grouting of joints, excavation and replacement of faulty or damaged portions of the work, and all final restoration.

D. Closed Circuit Television Inspection

1. The Township will perform closed circuit television (CCTV) inspection of the sanitary sewer lines no sooner than 30 days after successful completion of mandrel and air testing and after completion of base paving and roadway stabilization is obtained.

2. Any deficiencies noted during the CCTV inspection shall be corrected by the Contractor.
3. The Authority reserve the right to conduct all required tests, including mandrel and air tests, to determine that corrective measures taken as a result of deficiencies noted during the CCTV inspection meet these standard specifications.
4. The Township reserves the right to perform CCTV inspection again at the end of the 18-month maintenance period.
5. The Authority will charge an hourly rate of $230.00 for Closed Circuit TV and High-Pressure Jetting (CCTV/HPJ) services. The CCTV/HPJ hourly rate shall include two operators, all necessary equipment, and a 5% administrative processing fee. The service will require a two (2) hour minimum charge per site visit, with charges beginning at time of arrival on site to departure from site. Should work be required beyond normal business hours of 8:00AM to 4:00PM - Monday through Friday, the hourly rate will increase to $285.00 to cover labor overtime costs only. In the event traffic control services are required to conduct the CCTV inspection in accordance with PADOT publication 213 "Temporary Traffic Control Guidelines", the Owner/Developer will be responsible for the full cost of flagging services.

E. Acceptance: Observation of successful testing of manholes and sewers by the Authority does not constitute acceptance of the system or any portion thereof. Only upon final inspection by the Authority, and upon written acceptance of same will the system or portion thereof be considered substantially completed. Upon such acceptance, the warranty period as specified for the manholes and sewers will commence.
   1. If, during this final inspection, any irregularities are observed, the condition must be corrected at the Contractor's expense prior to acceptance.

END OF SECTION

SECTION 02732

FORCE MAINS
FOR SANITARY SEWER SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Wastewater Sewer Force Main Piping.

B. Valves.

C. Air Release, Valve and Cleanout Manholes.

D. Thrust Restraint.

E. Force Main Testing.

1.02 RELATED SECTIONS

A. Trenching, Backfilling and Compacting: Section 02221.

B. Manholes: Section 02601.

C. Gravity Wastewater Sewer: Section 02731.

D. Division 3 - Concrete.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM D2261, Butt Heat Fusion Polyethylene Plastic Fittings, Spec. for.
   2. ASTM D2774, Underground Installation of Thermoplastic Pressure Piping, Spec. for.
   3. ASTM D3035, Polyethylene Plastic Pipe Based on Controlled Outside Diameter, Spec. for.
   4. ASTM D3350, Polyethylene Plastic Pipe and Fittings Materials, Spec. for.

B. American Water Works Association (AWWA):
   1. AWWA C906, Polyethylene Plastic Pipe and Fittings for Water, 4" through 63".

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 piping, piping specialties, restraint systems and valves.

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 pipe will be manufactured in accordance with specified reference standards for each pipe type.

1.05 QUALITY ASSURANCE

A. All products installed within PADOT right-of-way shall be certified in accordance with PADOT Publication 35 (Bulletin 15).

B. Source Quality Control:
   1. Shop Tests and Inspection: All materials furnished by the Contractor shall be certified by the supplier for compliance with the pertinent specifications. Shop inspections and testing may be required. The cost of shop testing shall be borne by the supplier or the Contractor.

C. Disposition of Defective Material: All material found during the progress of the work, either before or after installation, to have cracks, flaws or other defects will be rejected by the Authority. All defective materials furnished by the Contractor shall be promptly removed by him from the site at his own expense.

1.06 DELIVERY, STORAGE AND HANDLING

A. Replacement of Damaged Material: The Contractor shall replace, at his own expense, all material furnished by him and found defective in manufacture or damaged in handling after delivery by the manufacturer. This shall include the furnishing of all materials and labor required for replacement of installed material.

B. Responsibility for Safe Storage: The Contractor shall be responsible for the safe storage of material furnished by or to him, and accepted by him, and intended for the work, until it has been incorporated in the completed project. The interior of all pipe, fittings and other accessories shall be kept free from dirt and foreign matter, at all times. All equipment and materials subject to damage from freezing shall be drained and stored in a manner that will protect them.

C. Hauling: All materials furnished by the Contractor shall be delivered and distributed at the site by the Contractor.
   1. Pipe, fittings, items of equipment, and other materials of construction shall be loaded and unloaded by lifting with hoists or skidding so as to avoid shock or damage. Under no circumstances shall such materials be dropped.
   2. Materials handled on skidways shall not be skidded or rolled against materials already on the ground.

D. At Site of Work: In distributing the material at the site of the work, each piece shall be unloaded opposite or near the place where it is to be laid in the trench, or as otherwise directed by the Authority. Under no circumstances should lawns, grass plots or other private property be used for this purpose without the consent of the property owner.

1.07 SITE CONDITIONS

A. Environmental Requirements:
   1. Keep trenches dewatered until pipe joints have been made and concrete cradle, thrust blocks and encasement, if any, have cured.
   2. Under no circumstances lay pipe in water or on bedding containing frost.
   3. Do not lay pipe when weather conditions are unsuitable, as determined by the Authority, for pipe laying work.

PART 2 - PRODUCTS

2.01 PIPE AND PIPE FITTINGS

A. High Density Polyethylene (HDPE) Pipe: All force main pipe shall be high-density polyethylene pipe conforming to ASTM D3350. No substitutions allowed.
   1. Minimum DR 17 wall thickness for 100 psi working pressure in accordance with ASTM D3035.
   2. Pipe OD shall be compatible with ductile iron pipe sizes.
   3. Joints are to be heat fused, with the exception that fittings may be jointed by heat fusing, transition fittings or mechanical fittings.
   4. Fittings shall be butt fusion in accordance with ASTM D2261.
   5. Flanged and mechanical joint adaptors shall be PE 3408 HDPE.
   6. All fittings and adaptors shall have a pressure rating no less than that of the pipe.
   7. Pipe supplier shall also provide equipment necessary for heat fusion of pipe and fittings and shall also provide training and assistance to the Contractor in joining of pipes and fittings.

2.02 SEWAGE VALVE

A. Sewage Air Release Valve: Designed to automatically release air, gas or vapor under pressure during system operation. Valve design shall feature long body and float stem components so that the operating mechanism is kept free from contact with sewage during operation. Valve construction as follows:
   1. Valve Body and Cover: Cast iron, ASTM A48, Class 35.
   2. Maximum Working Pressure: 75 psi
   3. Vent Orifice: 5/16-inch
   4. Discharge Orifice Seat, Mechanism and Valve Stem: Stainless Steel.
   5. Orifice Button: Stainless steel and Buna-N, Nitrile Rubber ASTM SB 800.
   6. Mechanism Lever Pins and Float: High strength stainless steel, ASTM A240.
   7. Backflushing and Cleaning Accessories: Factory assembled to the valve and consisting of a shut-off valve at bottom inlet, a blow-off valve near the bottom of the valve body, quick disconnect couplings and shut-off valve at top of valve, and a 5-foot section of rubber hose with quick disconnect coupling.
   8. Acceptable Manufacturers:
      a. Val-Matic Valve and Manufacturing Corp.; Model No. 48 BWA.
      b. Or Equal.

B. Sewage Air and Vacuum Valve: Designed to automatically exhaust large quantities of air during the filling of a system and to allow air to re-enter the system during draining or when a vacuum occurs. Valve design shall feature long body and float stem components so that the operating mechanism is kept free from contact with sewage during operation. Valve construction as follows:
   1. Valve Body and Cover: Cast iron, ASTM A48, Class 35.
   2. Inlet Size: 2-inches.
   3. Discharge Orifice: 2-inches.
   4. Float Stem and Guide: Bronze, ASTM B584.
   5. Floats: Stainless Steel, ASTM A240.
   6. Orifice Seat: Buna-N, Nitrile Rubber, ASTM SB 800.
   7. Backflushing and Cleaning Accessories: Factory assembled to the valve and consisting of an inlet shut-off valve, a 1-inch blow-off valve near the bottom of the valve body, quick disconnect couplings and a 1/2-inch shut-off valve at the top of valve, and a section of rubber hose with quick disconnect coupling.
   8. Acceptable Manufacturers:
      a. Val-Matic Valve and Manufacturing Corp.; Model No. 300 Series.
      b. Or Equal.

C. Sewage Combination Air Valves: Consisting of an air release valve and an air and vacuum valve factory piped into a compact assembly. The combination assembly shall automatically release air, gas or vapor under system operating pressure and shall also allow air to re-enter the system during draining or when a vacuum occurs. Combination valve designs shall feature long bodies and float stem components so that the operating mechanisms are kept free from contact with sewage during operation. Valve construction as follows:

1. Valve Bodies and Covers: Cast iron, ASTM A48, Class 35.
2. Inlet Sizes: 2-inches.
3. Air Release Outlet Size: 1/2-inch, NPT.
4. Vacuum Discharge/Outlet Size: 2-inches.
5. Air Release Valve Maximum Working Pressure: 75 psi.
6. Air Release Valve Vent Orifice: 5/16-inch.
7. Air Release Valve Discharge Orifice Seat, Mechanism and Valve Stem: Stainless Steel.
8. Air Release Valve Orifice Button: Stainless Steel and Buna-N, Nitrile Rubber ASTM SB 800.
9. Air Release Valve Mechanism Lever Pins and Float: High strength stainless steel, ASTM A240.
10. Air and Vacuum Valve Float Stem and Guide: Bronze, ASTM B584.
11. Air and Vacuum Valve Floats: Stainless Steel, ASTM A240.
12. Air and Vacuum Valve Orifice Seat: Buna-N, Nitrile Rubber, ASTM SB 800.
13. Backflushing and Cleaning Accessories: Factory assembled to the combination valves and consisting of two inlet shut-off valves, two blow-off valves, two clear water inlet valves, section of rubber hose and quick disconnect couplings.
14. Acceptable Manufacturers:
    a. Val-Matic Valve and Manufacturing Corp.; Model No. 48 or 49/300 Series.
    b. Or Equal.

2.03 AIR RELEASE MANHOLES

A. Materials for air release manholes as specified for precast manholes in Section 02601.

2.04 CLEANOUTS

A. Cleanouts shall be constructed as detailed on the approved subdivision Drawings. Ball or plug valves shall be installed at the locations indicated on the approved subdivision Drawings.

2.05 VALVES AND APPURTENANCES

A. Valves: Cast iron ball or plug valves shall be installed on service, low pressure and force main lines at the locations indicated on the approved subdivision Drawings. Valves installed in valve/cleanout pits shall be actuated with a quarter turn type hand lever. Buried valves shall be actuated with an underground actuator through a cast iron valve box. Ball valves on individual properties shall be oriented with the seat in place for pressure.

B. Painting: All surfaces of each valve body assembly shall be clean, dry and free from grease before painting. All unmachined surfaces of the valve body assembly shall be

wire brushed down to clean metal. Two coats of an asphalt varnish shall be applied in accordance with AWWA C500.

C. Spare Parts and Tools: Repair or service parts for one of each type and size of valve used in this work shall be furnished and stored as directed by the Authority. The equipment shall include, in general, the following items: special tools required for maintenance or operation of valves, gaskets, rings, seals, lubricants, bolts, washers, and miscellaneous accessories required to maintain valves in proper operating service.

D. Flanges: All flanged valves shall be drilled and faced to the ASA 125-pound standard template, and in accordance with ANSI B16.1.

E. Gate Valves 2 Inches and Larger: All gate valves 2" and larger shall conform in all respects to AWWA Specification C500, and Federal Specification WW-V-50b, Type II, Class I. All valves shall be of the double disc, non-rising stem type, with iron body full bronze mounted. Gate valves shall be of such design as to maintain the full area of the pipe through the valve when open and shall be designed to take the full unbalanced pressure upon either face.
   1. Valves shall open left (counter-clockwise) and shall be supplied with operators as shown on the drawings and specified herein.
   2. Exposed manually actuated valves shall be handwheel actuated unless otherwise indicated. Handwheel operators shall be designed to hold the valve in any intermediate position between fully open and fully closed without creeping or fluttering.
   3. Buried valves shall have 2" square cast iron operating nuts. Each valve shall also be supplied with a roadway type valve box.
   4. Buried valves shall be supplied with mechanical joint end connections.

F. Valve Boxes: Standard 7-inch cast iron extension roadway type valve boxes shall be installed over buried valves and service line cleanouts. Screw threads shall be cast integrally with box wall. Welded screw threads are not acceptable.

PART 3 - EXECUTION

3.01 PREPARATION

A. Earthwork: Perform earthwork for force mains as specified in Trenching, Backfilling and Compacting: Section 02221.

3.02 PIPE INSTALLATION:

A. General: All pipe shall be laid and maintained to the required lines and grades with fittings and valves at the required locations with spigots centered in bells and all valves plumb. The pipe shall be laid in the backfill materials as specified. Pipe laying shall commence at the lowest point and proceed upgrade.

B. Pipe shall be installed in accordance with ASTM D2774.

C. Construction Control: During the installation of a force main, the pipe shall be laid at a constantly increasing grade to each high point, air release manhole, or point of discharge, as indicated on the Drawings. The Contractor shall provide sufficient construction control to assure that there are no sags or loss in grade in the force main which could tend to accumulate air other than at the high points shown on the approved subdivision Drawings. Failure to comply with this requirement shall necessitate the Contractor take remedial steps to correct this situation. All such costs shall be borne by the Contractor.

D. Variations: The Authority reserves the right to vary the line and/or grade from that shown on the approved subdivision Drawings for the pipelines and manholes and to vary the location of fittings and valves when such changes may be necessary or advantageous.

E. Caution in Excavation: The Contractor shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground structures, both known and unknown, may be determined, and he shall be held responsible for the repair of such structures when broken or otherwise damaged because of carelessness on his part.

F. Subsurface Explorations: Whenever it is necessary to explore and excavate to determine the location of existing underground structures, the Contractor shall make explorations and excavations for such purposes.

G. Depth of Pipe: All pipe shall be laid to the depth indicated on the approved subdivision Drawings or a minimum of 4.0' from grade to the crown of pipe.

H. Handling of Sewer Line Materials Into Trench: Proper implements, tools and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and convenient prosecution of the work. All pipe, fittings, valves, etc., shall be carefully lowered into the trench piece by piece by means of a derrick, ropes or other suitable tools or equipment, in such a manner as to prevent damage to sewer line materials, protective coatings and linings. Under no circumstances shall such materials be dropped or dumped into the trench.

I. Laying Pipe: Every precaution shall be taken to prevent foreign material from entering the pipe while the pipe is being placed in the trench. If the pipe-laying crew cannot put the pipe into the trench and in place without allowing earth into it, the Engineer may require that before lowering the pipe into the trench, a heavy, tightly woven canvas bag of suitable size shall be placed over each end and let there until the connection is to be made into the adjacent pipe. During laying operations, no debris, tools, clothing or other material shall be placed in the pipe. After placing a length of pipe in the trench, the spigot end shall be centered in the bell or coupling and the pipe forced home and

brought to correct line and grade. The pipe shall be secured in place with approved backfill material tamped under it except at the joints. Pipe and fittings that do not allow a sufficient and uniform space for joints shall be removed and replaced with pipe and fittings of proper dimensions to ensure such uniform space.

1. Precautions shall be taken to prevent dirt from entering the joint space.
2. At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means approved by the Authority. This provision shall apply during the noon hour as well as overnight. If water is in the trench, the seal shall remain in place until the trench is pumped completely dry.

J. Cutting Pipe: The cutting of pipe for inserting valves, fittings or closure pieces shall be done in a neat and workmanlike manner, without damage to the pipe, to leave a smooth end at right angles to the axis of the pipe.

K. Unsuitable Conditions for Laying Pipe: No pipe shall be laid in water or when, in the opinion of the Authority, trench conditions are unsuitable.

L. Contractor shall install underground electronic marker balls at all horizontal bends. Such marker balls will be provided to the Contractor by the Authority. Contractor shall be charged a fee for each marker ball at the Authority's actual cost per ball.

3.03 PIPE JOINTING

A. Jointing PE Pipe: Make joints by thermal butt-fusion in accordance with ASTM F2620 and as recommended by manufacturer to properly affect the joint seal.

3.04 SETTING FITTINGS AND VALVES

A. General: Valves and fittings shall be set and jointed to pipe in the manner specified previously for cleaning, laying and jointing pipe.

B. Provide a precast concrete manhole for every air release and vacuum valve meeting the requirements for manholes as previously specified. The manholes shall be constructed to permit valve repairs and afford protection to the valve and pipe from impact where they pass through the manhole walls. All valves and fittings shall be supported by saddles as indicated on the approved subdivision Drawings. The saddles shall be continuous under all valves and fittings within the valve manholes.

3.05 ANCHORAGE

A. Concrete Thrust Blocks: Provide concrete thrust blocks for all fittings, and at all locations where horizontal and/or vertical deflections are made in the joints of the piping.

1. Reaction Backing: Reaction backing shall be 2500 psi concrete as specified in Section 03300. Backing shall be placed between solid ground and the fitting to be anchored; the area of bearing on the pipe and on the ground in each instance shall be as indicated on the approved subdivision Drawings or directed by the Authority. The backing shall, unless otherwise indicated or directed, be so placed that the pipe and fitting joints will be accessible for repair.

B. Anchorage for Bends: All bends deflecting 11.25 degrees or more on mains shall be provided with a thrust restrain system to prevent movement.

3.06 MANHOLES

A. As specified in Section 02601.

3.07 FIELD QUALITY CONTROL

A. Hydrostatic Tests
1. Pressure Test: After the pipe has been laid and backfilled as specified, all newly laid pipe or any valves section thereof, shall be subjected to a hydrostatic pressure of 150 pounds per square inch, or 50% in excess of the normal working pressure, whichever is greater. Where any section of a main is provided with concrete reaction backing, the hydrostatic pressure test shall not be made until at least five days have elapsed after the concrete reaction backing was installed. If high early strength cement is used in the concrete reaction backing, the hydrostatic pressure test shall not be made until at least two days have elapsed.
   a. Duration of Test: Two hours.
   b. Procedure: Each section of pipe shall be slowly filled with water and the specified test pressure, based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Authority. The pump, pipe connections, and all necessary apparatus including gauges, shall be furnished by the Contractor. The Contractor will make all taps into the pipe and furnish all necessary assistance for conducting the tests.
   c. Expelling Air Before Test: Before applying the specified test pressure, all air shall be expelled from the pipe. If permanent air vents are not located at all high points, the Contractor shall make the necessary taps at such points before the test is made. After the test has been completed, the Contractor shall insert plugs at the tapping points.
   d. Examination Under Pressure: Any cracks or defective pipes, fittings, or valves discovered in consequence of this pressure test, shall be removed and replaced by the Contractor with sound material, and the test shall be repeated until satisfactory to the Authority.

2. Leakage Test: A leakage test shall be conducted concurrently with the pressure test. The Contractor will furnish laboratory calibrated test gauge and measuring device, and all necessary assistance to conduct the test.
   a. Leakage Definition: Leakage is defined as the quantity of water that must be supplied into the newly laid pipe, or any valve section thereof, to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.
   b. Permitted Leakage: No pipe installed will be accepted until the leakage is less than the number of gallons per hour as determined by the formula:

$$L = \frac{SD\sqrt{P}}{133{,}200}$$

in which "L" equals the allowable leakage in gallons per hour; "S" is the length of pipeline tested in feet; "D" is the nominal diameter of the pipe, in inches, and "P" is the average test pressure during the leakage test, in pounds per square inch gauge. (The allowable leakage according to the formula is equivalent to 11.65 U.S. Gal. per 24 hours per mile of pipe per inch nominal diameter, for pipe in 18' lengths evaluated on a pressure basis of 150 psi). When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gallon per hour per inch of nominal valve size shall be allowed. There shall be no additional leakage allowed for service connections.
      1). The Authority will record both the makeup water and pressure at one-half hour intervals during the test period.
      2). Should any test of pipe laid disclose leakage greater than that specified above, the Contractor shall, at his own expense, locate, repair, and replace the defective joints, pipe, or fittings until the leakage is within the specified allowance.
3. Common Requirements:
   a. Authority Presence: The Authority shall monitor the pressure and leakage tests. The Contractor shall notify the Authority of the test day at least 48 hours in advance.
   b. Weather: No testing will be authorized unless air temperature is 35 degrees F. or higher.
   c. Acceptance: Observation of successful testing of force mains or manholes by the Authority does not constitute acceptance of the system or any portion thereof. Upon completion of any determined portion of a total system, and successful testing thereof, the Authority may recommend final acceptance. Only upon final inspection by the Authority and upon written acceptance for same will the system or portion thereof be considered substantially completed. Upon such acceptance, the warranty period as specified for the force main or manholes will commence. If, during this final inspection, any irregularities

are observed, the condition must be corrected at the Contractor's expense prior to acceptance.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE
FOR SANITARY SEWER SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Concrete materials and mixes for the following:
   1. Concrete Cradle and/or Encasement.
   2. Reaction Backing (Thrust Blocks).
   3. Manhole Base Channel Fill.
   4. Manhole Bases.

1.02 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified:
   1. ACI 350; Concrete Sanitary Engineering Structures.

1.03 REFERENCES

A. American Association of State Highway and Transportation Officials, AASHTO M182 Burlap cloth made from Jute or Kenaf.

B. American Concrete Institute (ACI):
   1. ACI 301; Specifications for Structural Concrete for Buildings.
   2. ACI 304; Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
   3. ACI 305R; Hot Weather Concreting.
   4. ACI 306R; Cold Weather Concreting.
   5. ACI 308; Standard Practice for Curing Concrete.

C. American Society for Testing and Materials (ASTM):
   1. ASTM C33; Concrete Aggregates, Spec. for.
   2. ASTM C39; Compressive Strength of Cylindrical Concrete Specimens, Test Method for.
   3. ASTM C94; Ready-Mixed Concrete, Spec. for.
   4. ASTM C143; Slump of Portland Cement Concrete, Test Method for.
   5. ASTM C150; Portland Cement, Spec. for.
   6. ASTM C171; Sheet Materials for Curing Concrete, Spec. for.
   7. ASTM C172; Sampling Freshly Mixed Concrete, Method of.

8. ASTM C173; Air Content of Freshly Mixed Concrete by the Volumetric Method, Test Method of.
9. ASTM C231; Air Content of Freshly Mixed Concrete by the Pressure Method, Test Method of.
10. ASTM C260; Air Entraining Admixtures for Concrete, Spec. for.
11. ASTM C309; Liquid Membrane - Forming Compounds for Curing Concrete, Spec. for.
12. ASTM C494; Chemical Admixtures for Concrete, Spec. for.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Portland Cement: ASTM C150 of the following Type:
   1. Type II, Moderate Sulfate Resistance for manhole bases or channel fill.
   2. Type I, Normal.

B. Normal Weight Aggregates: Meeting requirements of ASTM C33.

C. Water: Potable quality, clean and free of injurious amounts of oil, acid, alkali, organic matter, suspended matter, and other deleterious substances.

D. Concrete Admixtures:
   1. Air-Entraining Admixture: Use a product conforming to ASTM C260, certified by manufacturer to be compatible with other required admixtures.
   2. Water-Reducing Admixture: ASTM C494, Type A, and containing not more than 0.1 percent chloride ions.
   3. High-Range Water-Reducing Admixture (Super Plasticizer): ASTM C494, Type F or Type G and containing not more than 0.1 percent chloride ions.
   4. Water-Reducing, Non-Chloride Accelerator Admixture: ASTM C494, Type E, and containing not more than 0.1 percent chloride ions.
   5. Water-Reducing, Retarding Admixture: ASTM C494, Type D, and containing not more than 0.1 percent chloride ions.
   6. Prohibited Admixtures: Calcium chloride thyocyanates or admixtures containing more than 0.1 percent chloride ions are not permitted.

E. Moisture-Retaining Cover: One of the following, complying with ASTM C171.
   1. Waterproof paper.
   2. Polyethylene film.
   3. Polyethylene-coated burlap.

F. Liquid Membrane-Forming Curing Compound: Liquid type membrane-forming curing compound complying with ASTM C309, Type I, Class A. Moisture loss not more than 0.055 gr./sq. cm. when applied at 200 sq. ft./gal.
   1. Acceptable Manufacturers:
      a. Master Builders; Masterseal.
      b. L & M Construction Chemicals; L&M Cure.
      c. Or Equal.

2.02 PROPORTIONING AND DESIGN OF MIXES

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301.

B. Design Mixes: Provide normal weight concrete with the following properties:
   1. 2500 psi 28-day compressive strength.
   2. 3000 psi 28-day compressive strength.
   3. 4000 psi 28-day compressive strength.

C. Admixtures:
   1. Use water-reducing admixture or high range water-reducing admixture (super plasticizer) in concrete as required for placement and workability.
   2. Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 deg F (10 deg C).
   3. Use high-range water-reducing admixture in pumped concrete; concrete required to be watertight, and concrete with water/cement ratios below 0.50.
   4. Use air-entraining admixture in exterior exposed concrete, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of ± 1½ percent within following limits:
      a. Concrete structures and slabs exposed to freezing and thawing, deicer chemicals, or subjected to hydraulic pressure:
         1) 4.5 percent (moderate exposure); 5.5 percent (severe exposure) 1½" max. aggregate. 4.5 percent (moderate exposure); 6.0 percent (severe exposure) 1" max. aggregate.
         2) 5.0 percent (moderate exposure); 6.0 percent (severe exposure) 3/4" max. aggregate.
         3) 5.5 percent (moderate exposure); 7.0 percent (severe exposure) 1/2" max. aggregate.

D. Water-Cement Ratio: Provide concrete for following conditions with maximum water-cement (W/C) ratios as follows:
   1. 3000 psi W/C Ratio: 0.58 maximum (non air-entrained), 0.46 maximum (air-entrained).
   2. 2500 psi W/C Ratio: 0.67 maximum (non air-entrained), 0.54 maximum (air-entrained).

E. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:
   1. Slump: Not less than 1" nor more than 4".

2.03 CONCRETE MIXES

A. Job-Site Mixing: Mix materials for concrete in appropriate drum type batch machine mixer. For mixers of one cu. yd., or smaller capacity, continue mixing at least 1½ minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released. For mixers of capacity larger than one cu. yd., increase minimum 1½ minutes of mixing time by 15 seconds for each additional cu. yd., or fraction thereof.

B. Ready-Mix Concrete: Comply with requirements of ASTM C94, and as herein specified.
   1. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 may be required.
   2. When air temperature is between 85°F (30°C) and 90°F (32°C), reduce mixing and delivery time from 1½ hours to 75 minutes, and when air temperature is above 90°F (32°C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.01 CONCRETE PLACEMENT

A. General: Comply with ACI 304 “Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete,” and as herein specified.

B. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306.

C. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305.

3.02 CONCRETE CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
   1. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than seven (7) days.
   2. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least seven (7) days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

B. Curing Methods: Perform curing of concrete by curing and sealing compound, by moist curing, by moisture-retaining cover curing, and by combinations thereof, in accordance with ACI 308.

3.03 QUALITY CONTROL

A. Sampling and testing for quality control during placement of concrete may include the following, as directed by Engineer.
   1. Sampling Fresh Concrete: ASTM C172, except modified for slump to comply with ASTM C94.
   2. Slump: ASTM C143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
   3. Air Content: ASTM C173, volumetric method for lightweight or normal weight concrete; ASTM C231 pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.
   4. Concrete Temperature: Test hourly when air temperature is 40 deg F (4 deg C) and below, and when 80 deg F (27 deg C) and above; and each time a set of compression test specimens made.
   5. Compressive Strength Tests: ASTM C39; one (1) set for each day's pour exceeding 5 cu. yds. plus additional sets for each 50 cu. yds. over and above the first 25 cu. yds. of each concrete class placed in any one day; one specimen tested at seven (7) days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.

END OF SECTION

SECTION 09999

OVERALL REQUIREMENTS
FOR STORM SEWER SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. General requirements for construction of storm sewer systems with the goal of maintaining consistency with Bethlehem Township Standard Construction Documents, latest revision and other relevant external standards and specifications.

1.02 RELATED SECTIONS

A. Soil Erosion and Sedimentation Control: As shown on approved Subdivision Plans.

B. Protection of Underground Utilities: Section 02015.

1.03 REFERENCES

A. Pennsylvania Department of Transportation (PennDOT):
   1. Publication 408, as amended
   2. Publication 72M, as amended
   3. Publication 34 (Bulletin 15), as amended
   4. Publication 15M (Design Manual, Part 4 [DM-4]), as amended
   5. Publication 16 (Design Manual, Par 5 [DM-5]), as amended
   6. Any other PennDOT publications, design manuals, specifications, or other documents as may be applicable to the proposed improvements

B. Pennsylvania Department of Environmental Protection (PADEP):
   1. Erosion and Sediment Pollution Control Program Manual, as amended
   2. Pennsylvania Stormwater Best Management Practices Manual, as amended
   3. Any other PADEP documents as may be applicable to the proposed improvements

C. Bethlehem Township Standard Construction Documents, as amended

1.04 GENERAL REQUIREMENTS

A. Unless otherwise specified in these Standard Specifications for Additions and Improvements to the Storm and Sanitary Sewer Systems, all project items (including but not limited to design, construction, materials, submittals, construction observation,

testing, means and methods, suppliers, design, etc.) shall comply with the requirements in the documents listed in 1.03 above.

B. If any conflict arises between the documents listed in 1.03 above, the conflict shall be resolved in favor of the Bethlehem Township Standard Construction Specifications unless otherwise noted by the Township Engineer and/or Authority Engineer. When a potential conflict is found, the Township and/or Authority Engineer shall be consulted immediately for resolution.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Corrugated metal pipe (CMP) and similar products may not be utilized in the construction of storm sewers without the explicit written approval of the Authority and Engineer.

END OF SECTION

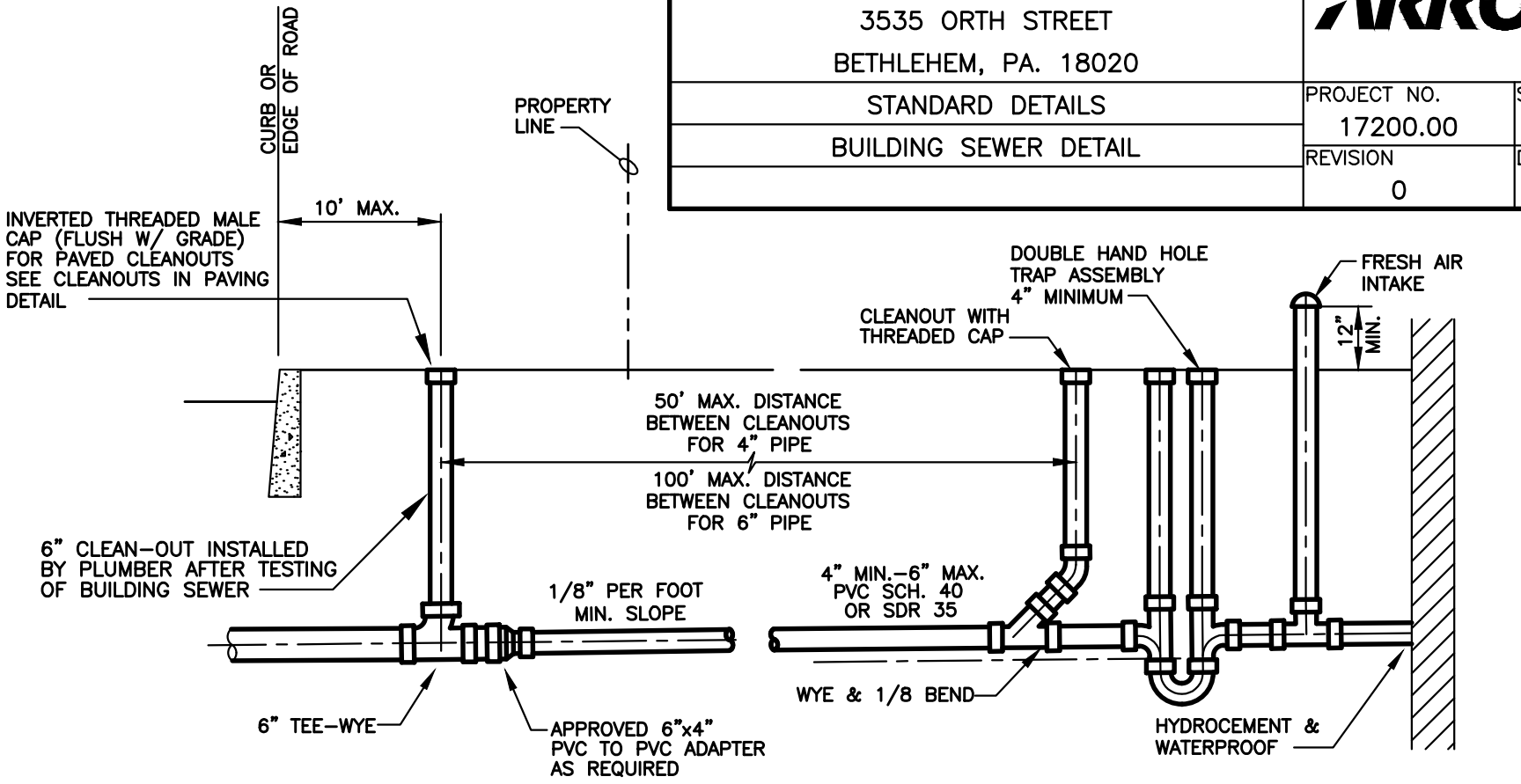
BETHLEHEM TOWNSHIP MUNICIPAL AUTHORITY
3535 ORTH STREET
BETHLEHEM, PA. 18020

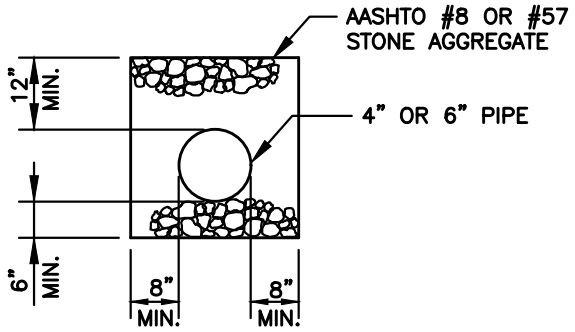
STANDARD DETAILS

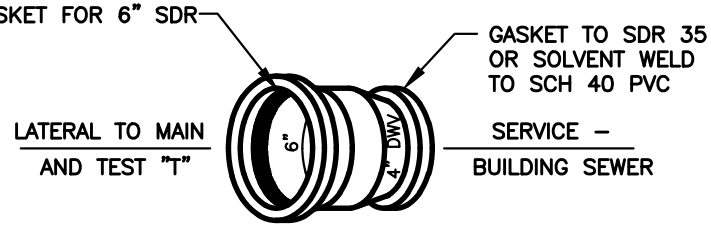
BUILDING SEWER DETAIL

ARRO
SUITE 200
321 N FURNANCE ST
BIRDSBORO, PA 19508
Tel 610.374.5285

PROJECT NO.	SCALE
17200.00	NONE
REVISION	DATE
0	09/2023







6" x 4" PVC ADAPTER

BUILDING SEWER DETAIL

FILE NO.1720000B1

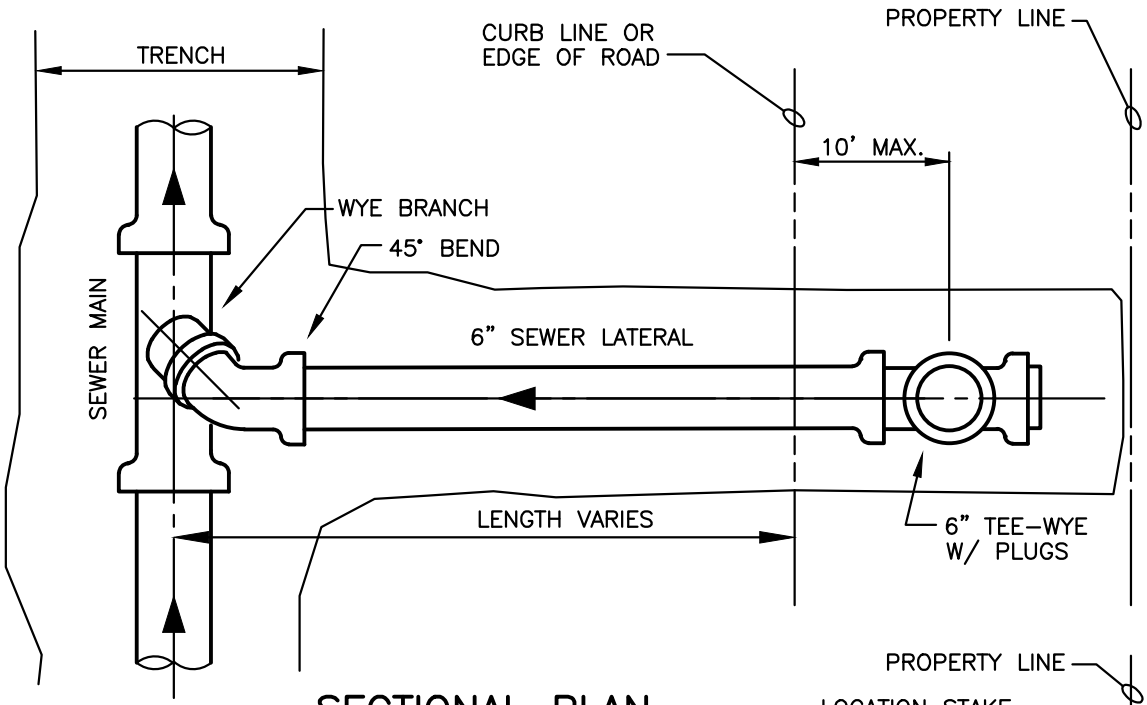
BETHLEHEM TOWNSHIP MUNICIPAL AUTHORITY
3535 ORTH STREET
BETHLEHEM, PA. 18020

ARRO
SUITE 200
321 N FURNANCE ST
BIRDSBORO, PA 19508
Tel 610.374.5285

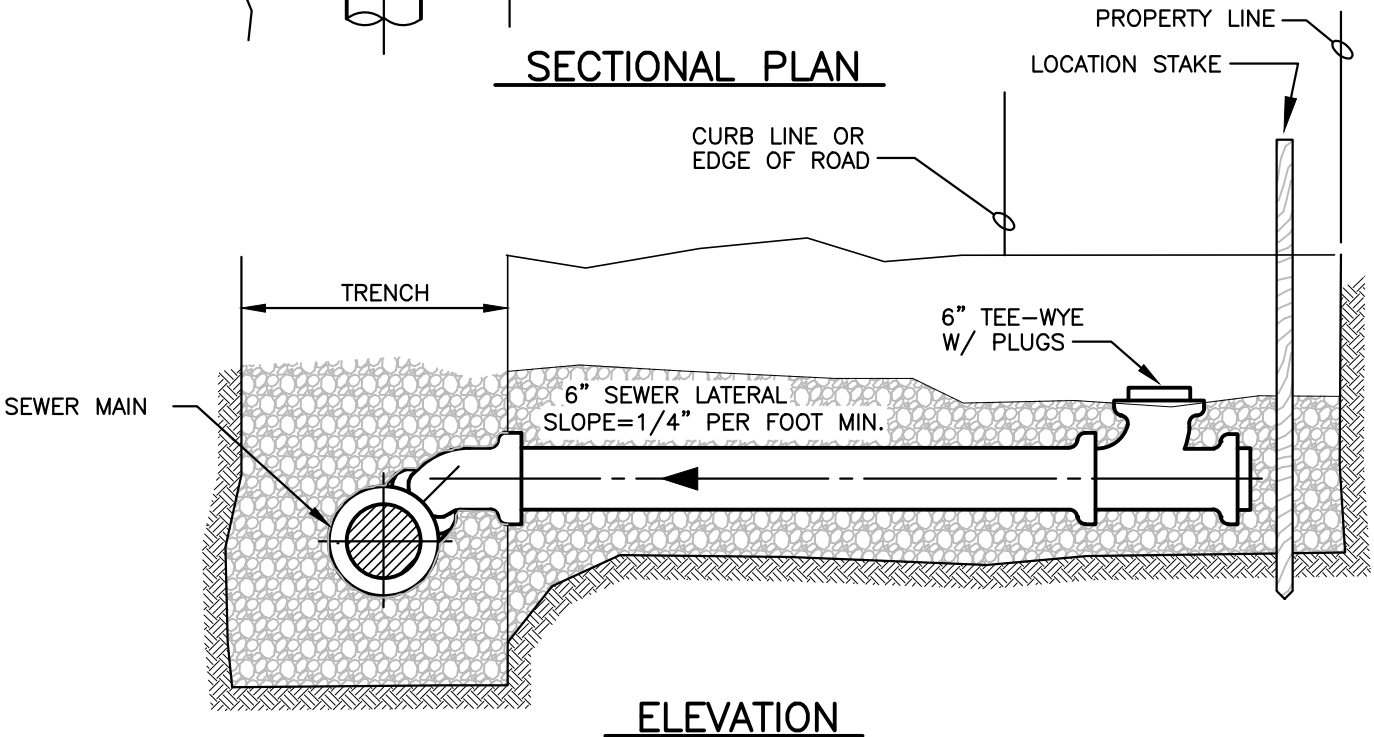
STANDARD DETAILS

TYPICAL LATERAL CONNECTION

PROJECT NO.	SCALE
17200.00	NONE
REVISION	DATE
0	09/2023



SECTIONAL PLAN

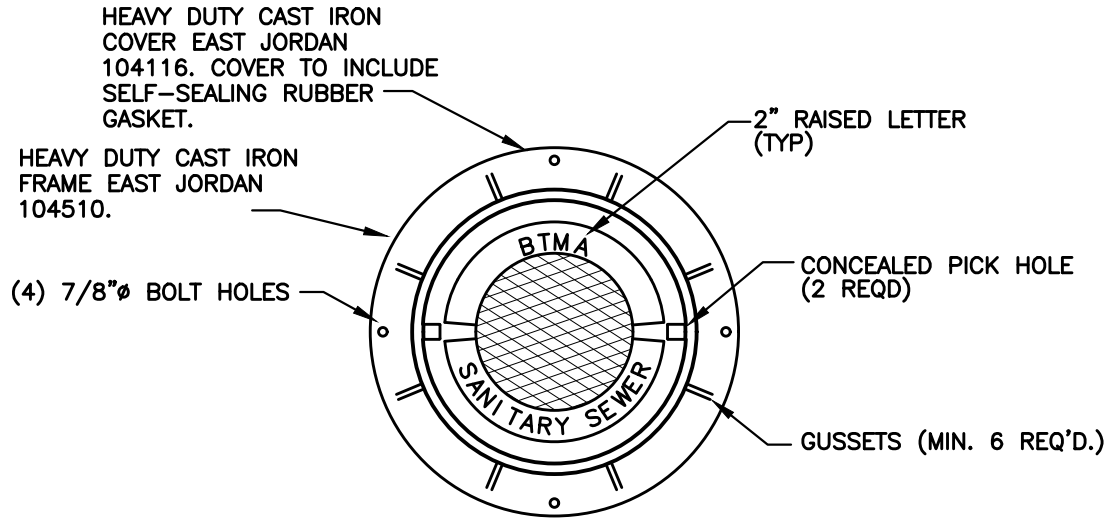


ELEVATION

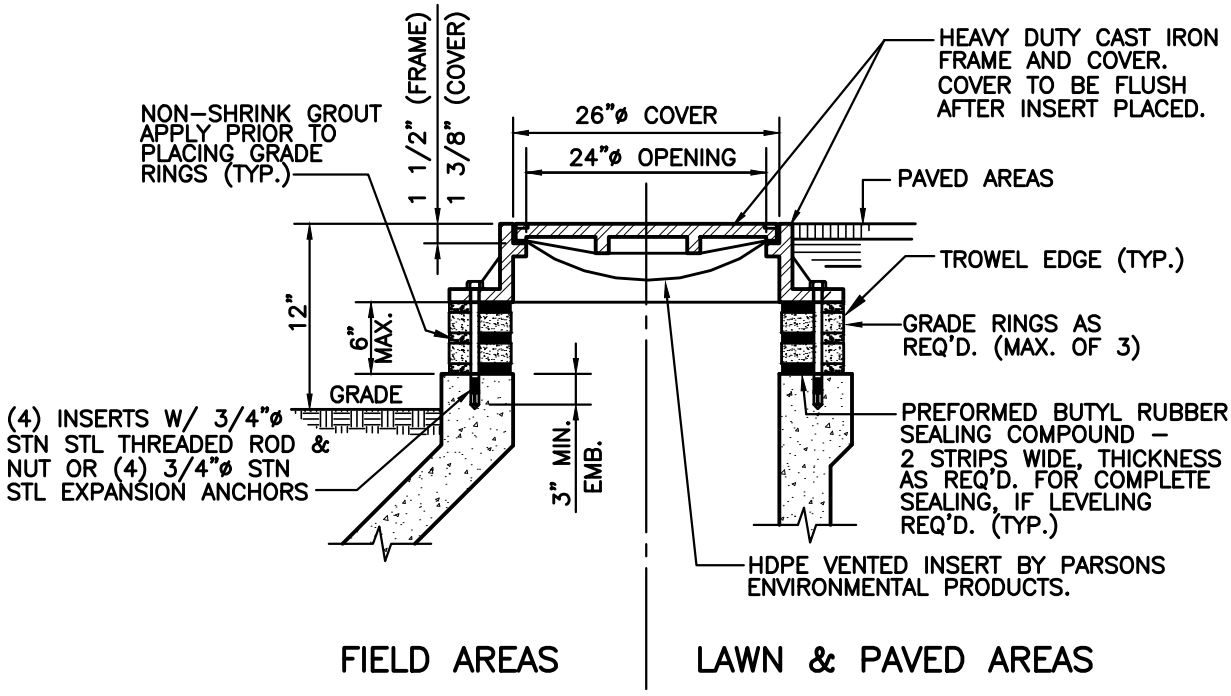
TYPICAL LATERAL CONNECTION

FILE NO. 1720000B2

BETHLEHEM TOWNSHIP MUNICIPAL AUTHORITY 3535 ORTH STREET BETHLEHEM, PA. 18020	ARRO SUITE 200 321 N FURNANCE ST BIRDSBORO, PA 19508 Tel 610.374.5285	
STANDARD DETAILS	PROJECT NO. 17200.00	SCALE NONE
MANHOLE FRAME & COVER	REVISION 0	DATE 09/2023



COVER PATTERN

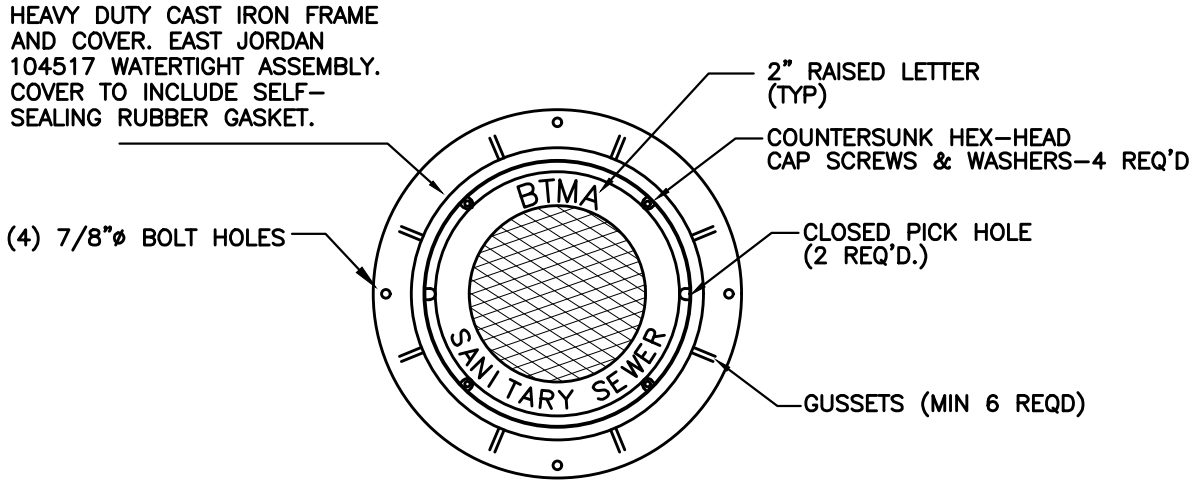


MANHOLE FRAME & COVER

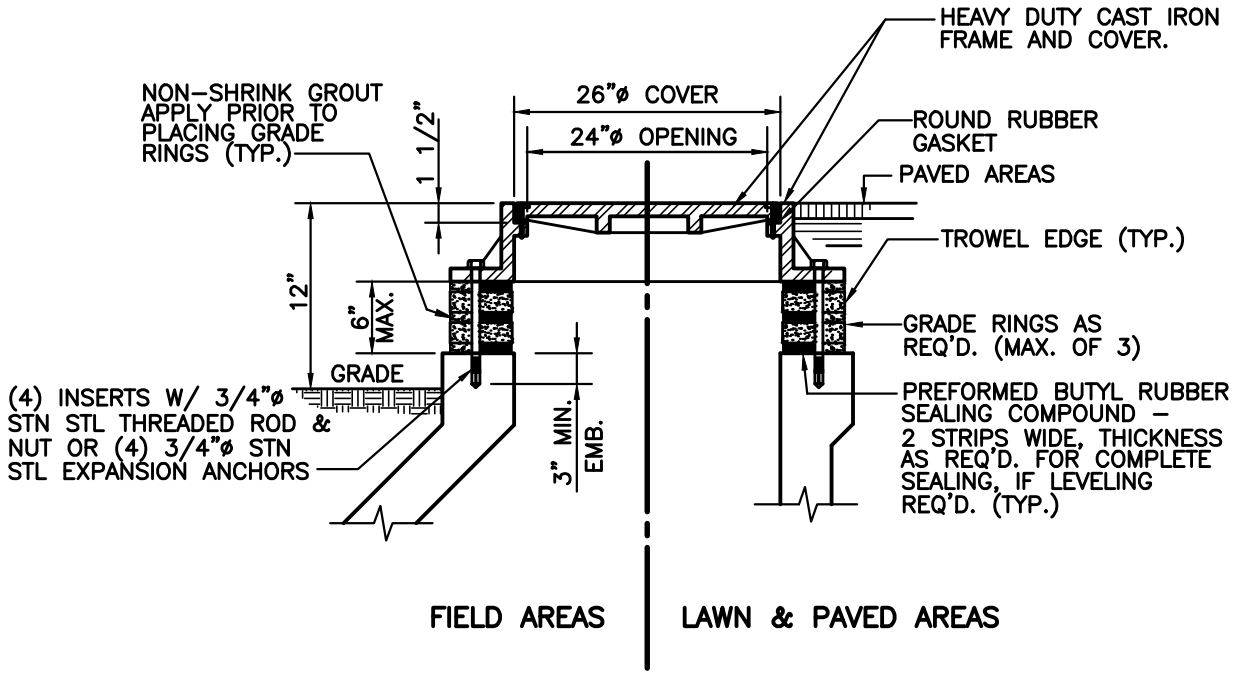
NO SCALE

FILE NO. 1720000B3

BETHLEHEM TOWNSHIP MUNICIPAL AUTHORITY 3535 ORTH STREET BETHLEHEM, PA. 18020	ARRO SUITE 200 321 N FURNANCE ST BIRDSBORO, PA 19508 Tel 610.374.5285	
STANDARD DETAILS	PROJECT NO. 17200.00	SCALE NONE
WATERTIGHT MANHOLE FRAME & COVER	REVISION 0	DATE 09/2023



COVER PATTERN



WATERTIGHT MANHOLE FRAME & COVER

FILE NO. 1720000B4

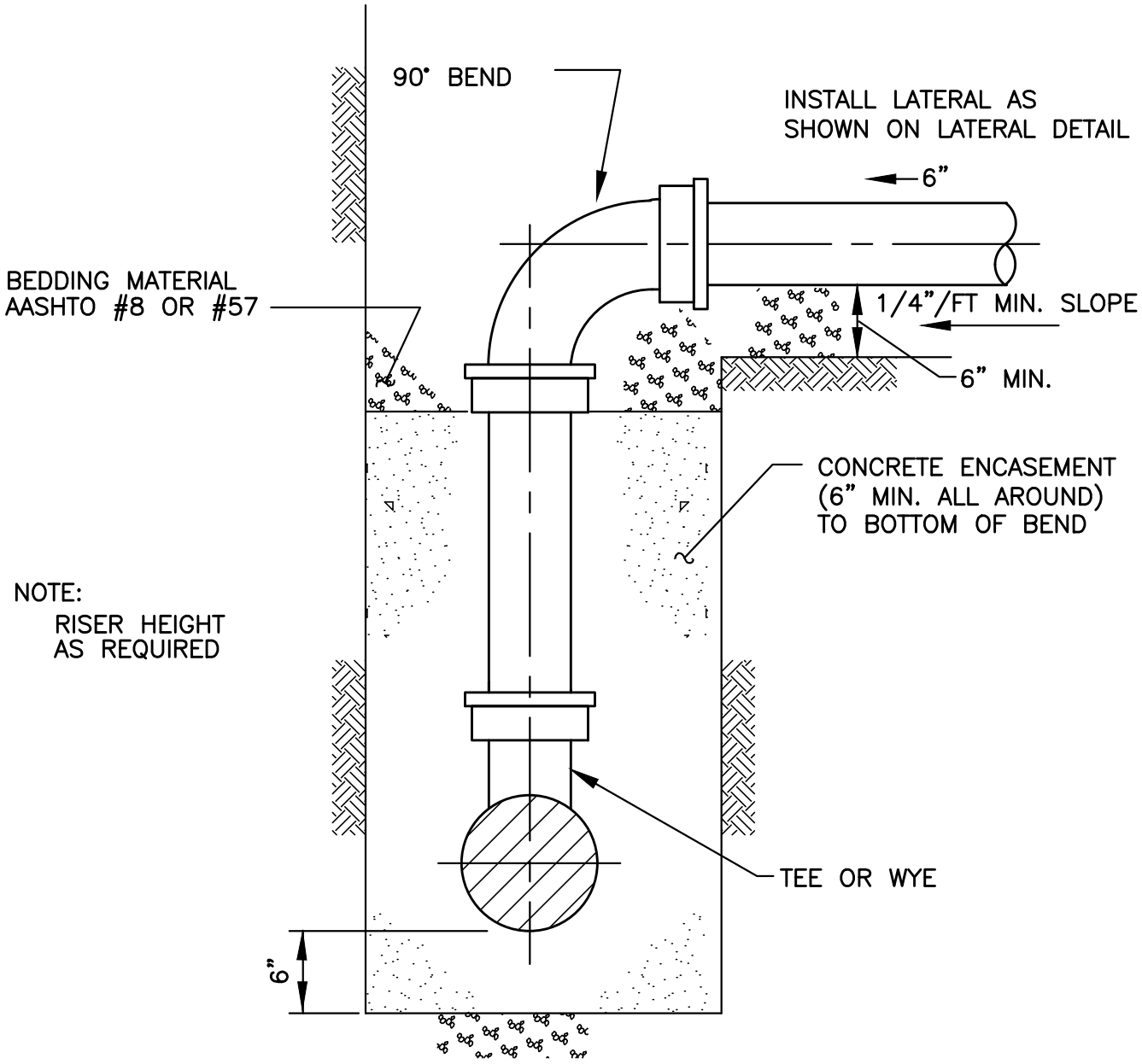
BETHLEHEM TOWNSHIP MUNICIPAL AUTHORITY
3535 ORTH STREET
BETHLEHEM, PA. 18020

ARRO
SUITE 200
321 N FURNANCE ST
BIRDSBORO, PA 19508
Tel 610.374.5285

STANDARD DETAILS

VERTICAL RISER LATERAL CONNECTION

PROJECT NO.	SCALE
17200.00	NONE
REVISION	DATE
0	09/2023



VERTICAL RISER LATERAL CONNECTION

FILE NO. 1720000B5

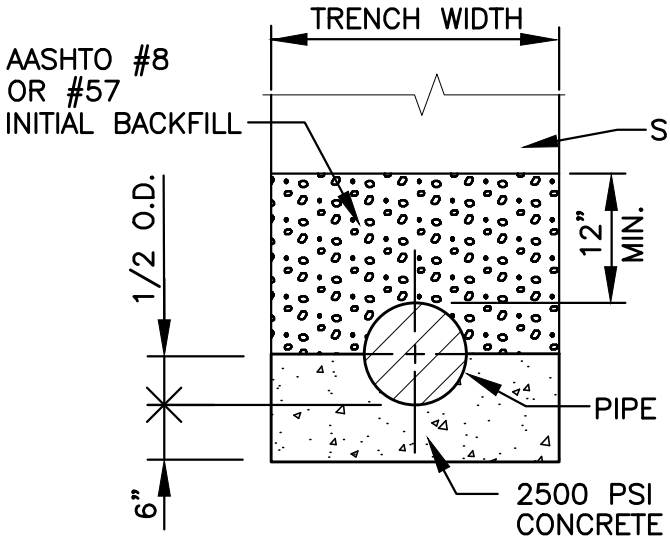
BETHLEHEM TOWNSHIP MUNICIPAL AUTHORITY
3535 ORTH STREET
BETHLEHEM, PA. 18020

ARRO
SUITE 200
321 N FURNANCE ST
BIRDSBORO, PA 19508
Tel 610.374.5285

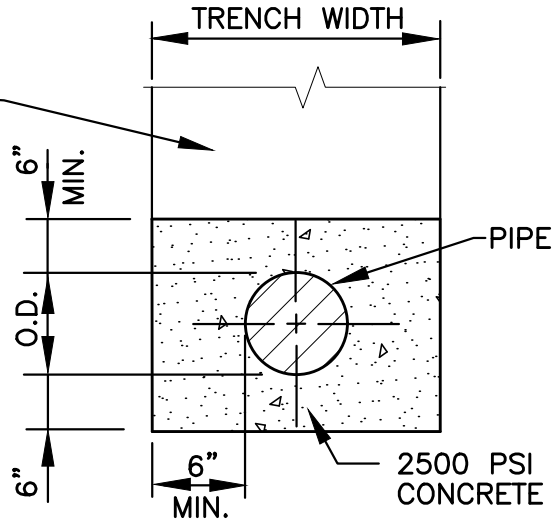
STANDARD DETAILS

PIPE BEDDING & ENCASEMENT DETAILS

PROJECT NO.	SCALE
17200.00	NONE
REVISION	DATE
0	09/2023



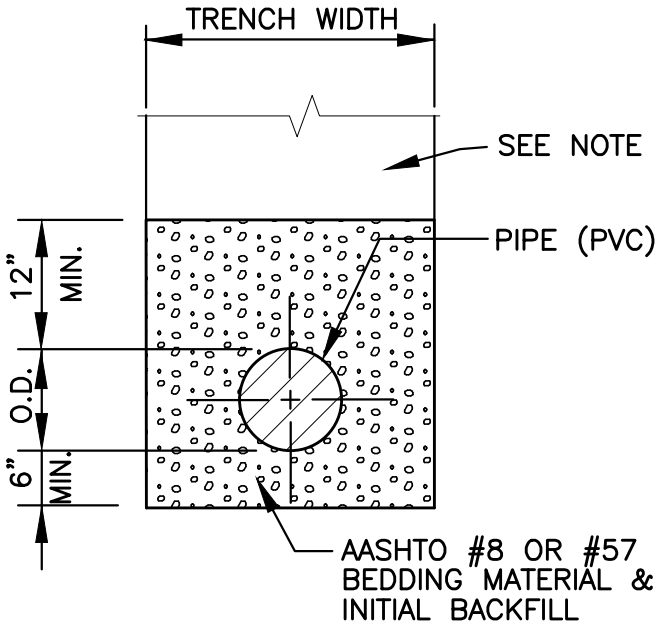
CONCRETE CRADLE



CONCRETE ENCASEMENT

NOTE:

COMPACTED SUITABLE EXCAVATED MATERIAL TO RESTORATION DEPTH. USE 2A STONE OR PADOT APPROVED BACKFILL MATERIAL IN EXISTING PAVED AREAS.



STANDARD BEDDING

PIPE BEDDING & ENCASEMENT DETAILS

FILE NO. 1720000B6

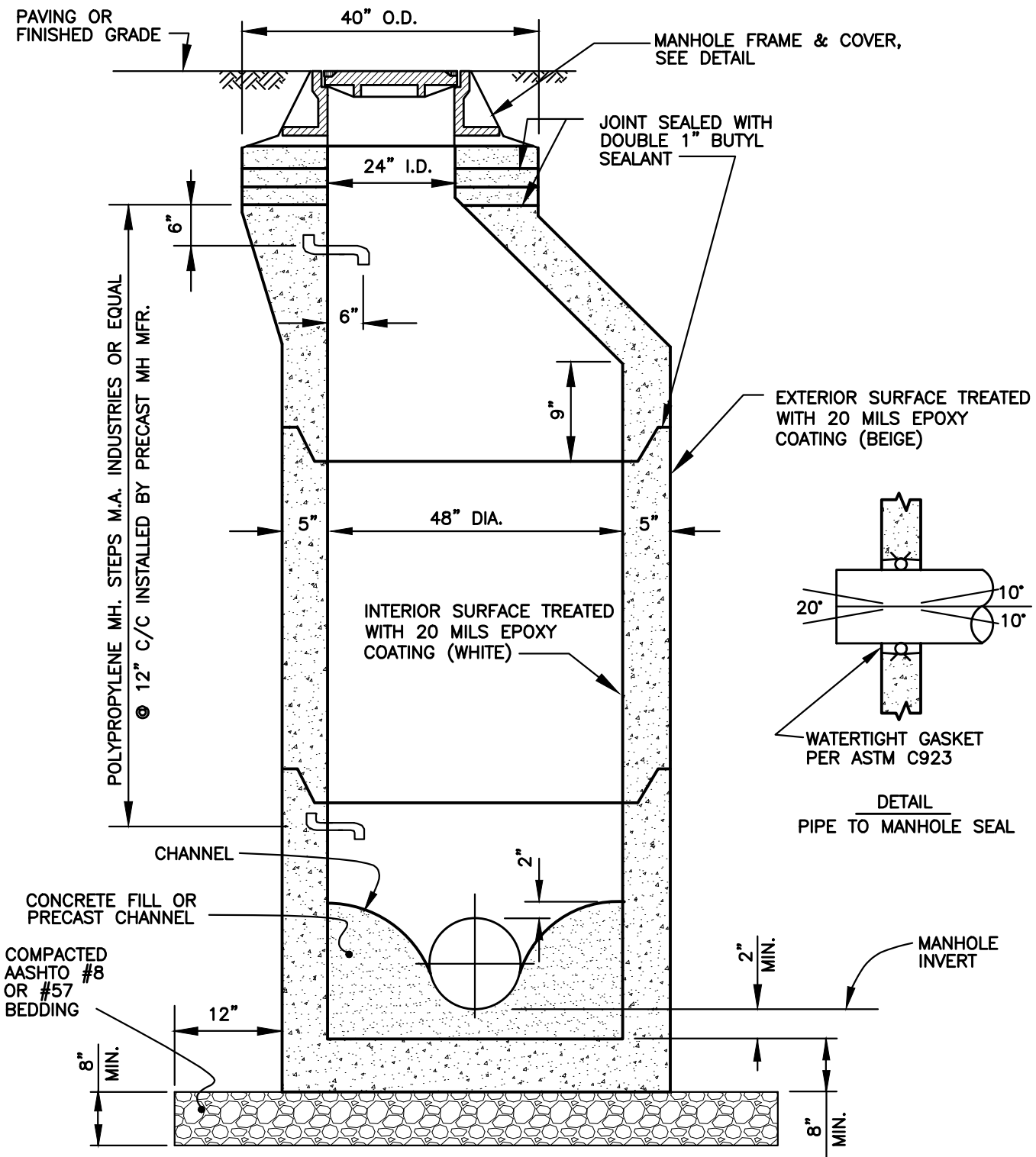
BETHLEHEM TOWNSHIP MUNICIPAL AUTHORITY
3535 ORTH STREET
BETHLEHEM, PA. 18020

ARRO
SUITE 200
321 N FURNANCE ST
BIRDSBORO, PA 19508
Tel 610.374.5285

STANDARD DETAILS

PRECAST CONCRETE MANHOLE W/ PRECAST BASE

PROJECT NO.	SCALE
17200.00	NONE
REVISION	DATE
0	09/2023



PRECAST MANHOLE WITH PRECAST BASE

NO SCALE

FILE NO. 1720000B7

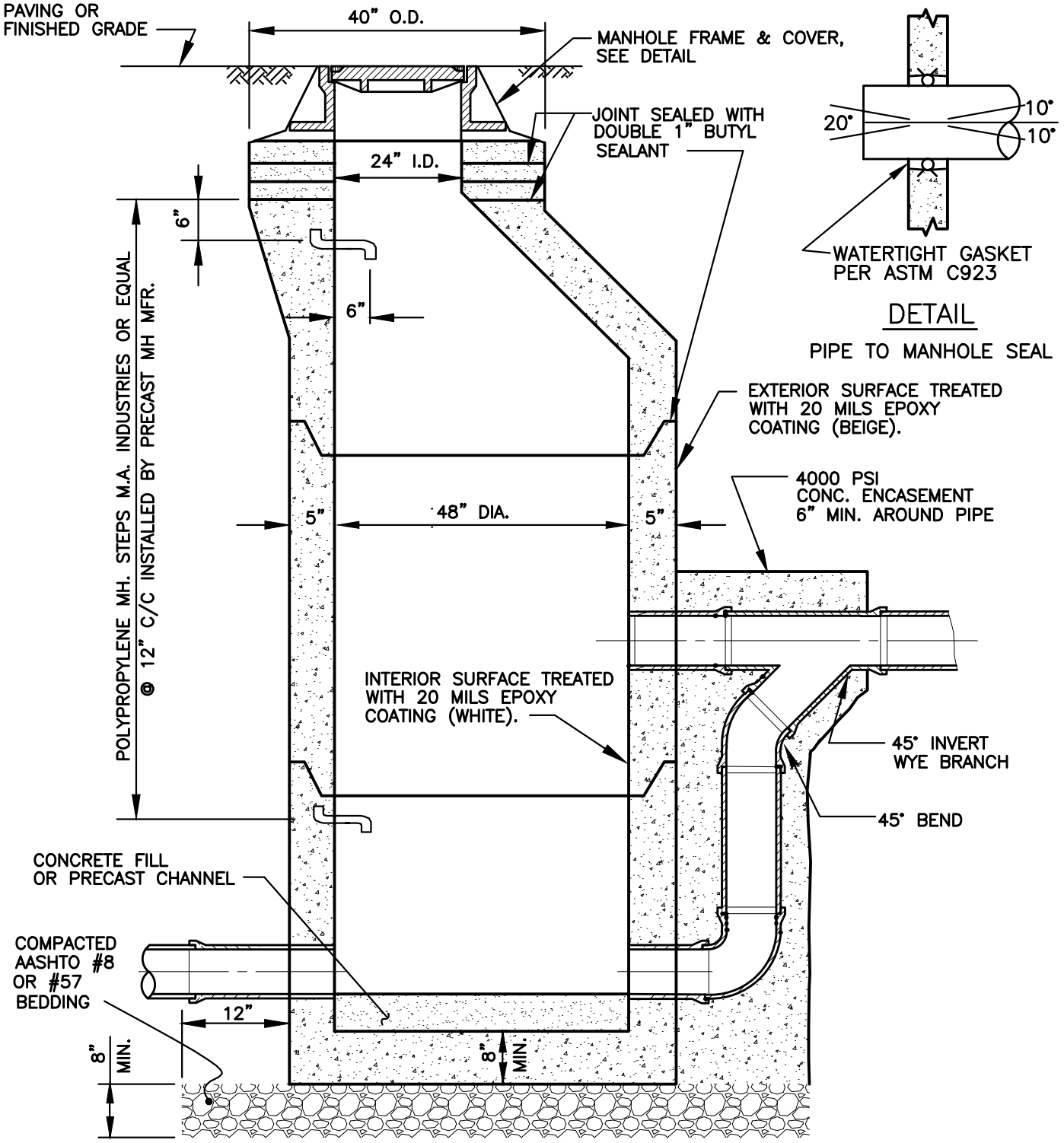
BETHLEHEM TOWNSHIP MUNICIPAL AUTHORITY
3535 ORTH STREET
BETHLEHEM, PA. 18020

ARRO
SUITE 200
321 N FURNANCE ST
BIRDSBORO, PA 19508
Tel 610.374.5285

STANDARD DETAILS

PRECAST DROP MANHOLE W/ PRECAST BASE

PROJECT NO.	SCALE
17200.00	NONE
REVISION	DATE
0	09/2023



PRECAST DROP MANHOLE WITH PRECAST BASE

NO SCALE

FILE NO. 1720000B8

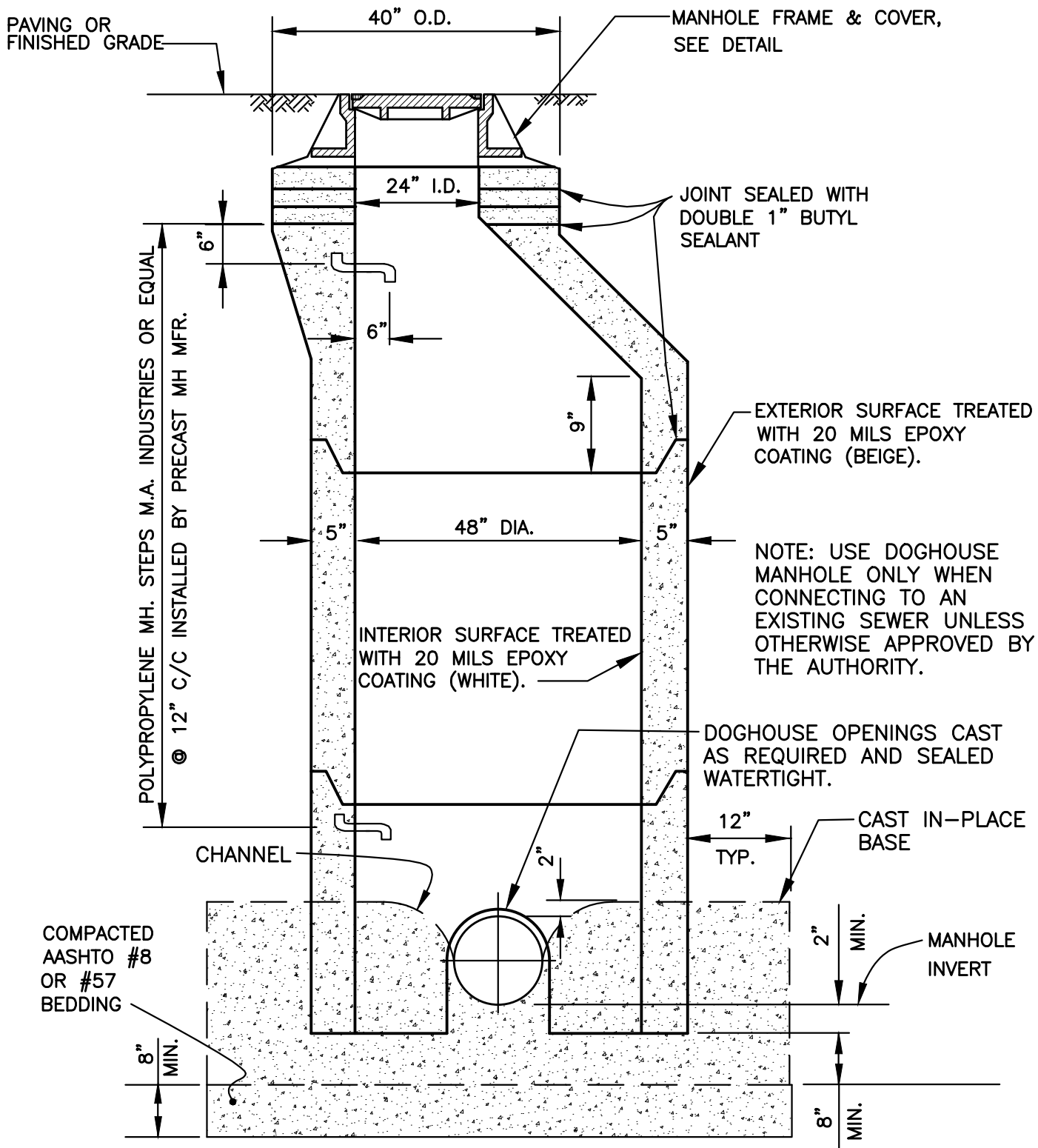
BETHLEHEM TOWNSHIP MUNICIPAL AUTHORITY
3535 ORTH STREET
BETHLEHEM, PA. 18020

ARRO
SUITE 200
321 N FURNANCE ST
BIRDSBORO, PA 19508
Tel 610.374.5285

STANDARD DETAILS

PRECAST CONCRETE DOGHOUSE MANHOLE W/
CAST IN-PLACE BASE

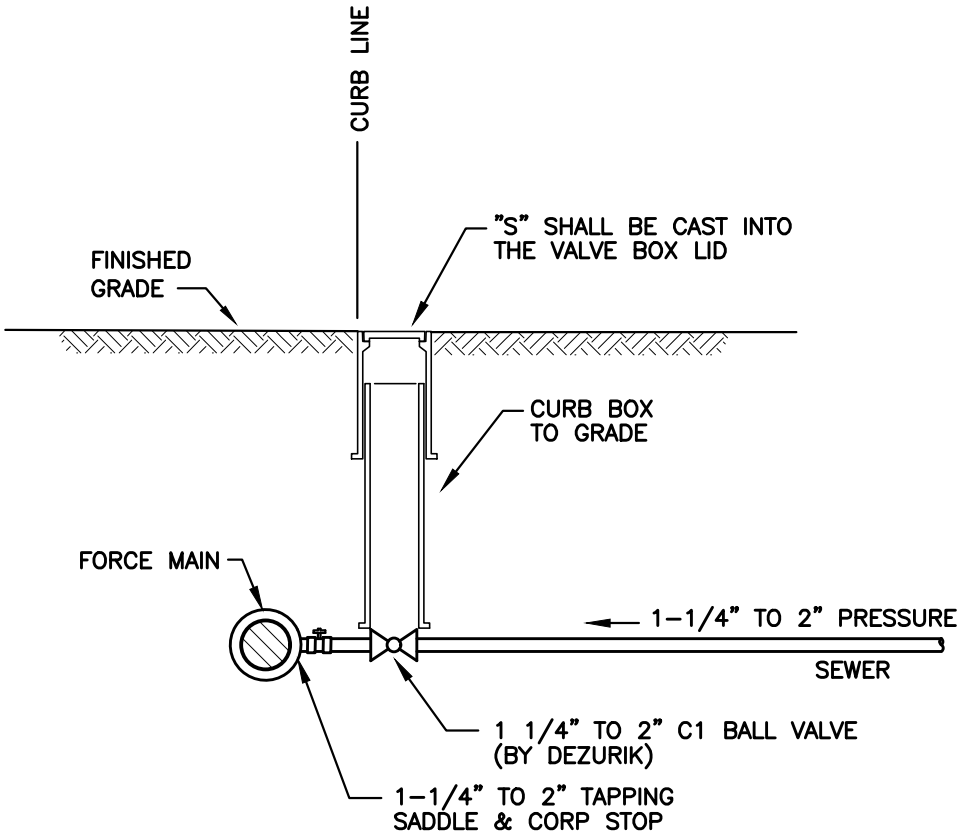
PROJECT NO.	SCALE
17200.00	NONE
REVISION	DATE
0	09/2023



PRECAST DOGHOUSE MANHOLE WITH IN-PLACE BASE

FILE NO. 1720000B9

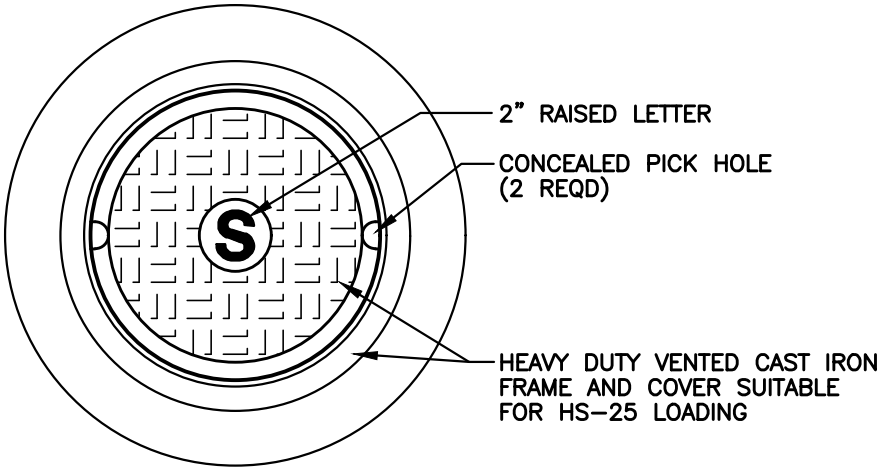
BETHLEHEM TOWNSHIP MUNICIPAL AUTHORITY 3535 ORTH STREET BETHLEHEM, PA. 18020	ARRO SUITE 200 321 N FURNANCE ST BIRDSBORO, PA 19508 Tel 610.374.5285	
STANDARD DETAILS	PROJECT NO. 17200.00	SCALE NONE
PRESSURE SEWER TO	REVISION 0	DATE 09/2023
FORCE MAIN CONNECTION		



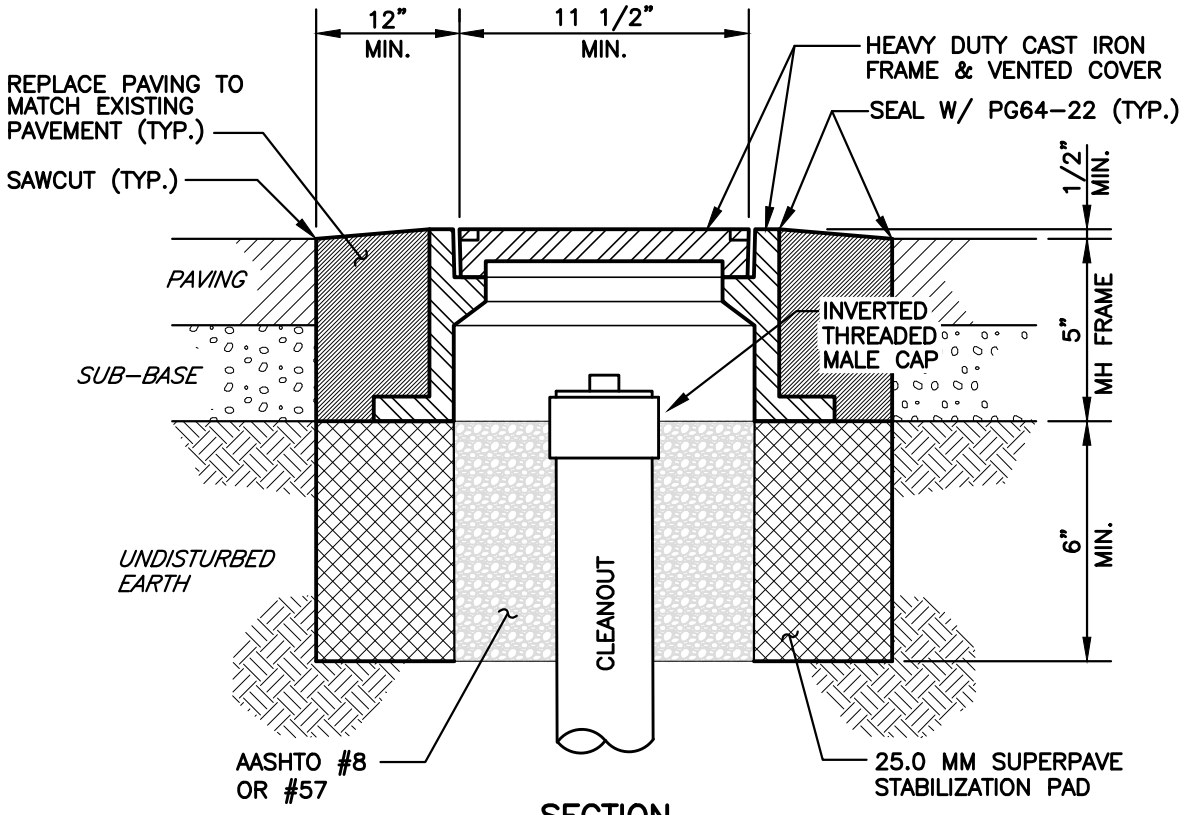
NOTE: PRESSURE SEWER SIZE SHALL BE 1-1/4" MINIMUM TO 2" MAXIMUM

FILE NO. 1720000B11

BETHLEHEM TOWNSHIP MUNICIPAL AUTHORITY 3535 ORTH STREET BETHLEHEM, PA. 18020	ARRO SUITE 200 321 N FURNANCE ST BIRDSBORO, PA 19508 Tel 610.374.5285	
STANDARD DETAILS	**PROJECT NO.** 17200.00	**SCALE** NONE
CLEANOUTS IN	**REVISION** 0	**DATE** 09/2023
PAVED AREAS DETAIL		



PLAN-COVER PATTERN



SECTION

FILE NO. 1720000B12